COAL AGE

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The Mine Telephone

By Berton Braley

Written expressly for Coal Age

"Ting-a-ling-a-ling" you can hear my noisy ring
As it echoes in the chambers of the mine,
When I clearly come across with the orders of the boss
Which are ripping in a volley down my line,
Though for miles the workings run I have hitched 'em up as one,
I have made the mine a unit by my call,
From the busy bottom pump to the breaker and the dump
I'm the blooming nervous system of it all!

"Ting-a-ling-a-ling," hear the message that I fling,
"There's a cave in Number 20, send a crew,"
So they listen to my shout and they come and dig us out
While without me 'twould be hours before they knew.
On my slender singing wire thrills the warning of the fire,
I give notice of the vapor's deadly breath,
And again and yet again I have saved the lives of men
Who would otherwise have faced a fearful death.

"Ting-a-ling-a-ling," you can hear my noisy ring
With its tintinnabulation on the ear,
I'm the terror of the shirk as I drive him on to work
But when danger comes he's thankful I am here,
I'm the foe of all delay and I help to "make her pay"
As a master of efficiency I shine,
From the collar to the sump I can keep 'em "on the hump"
I'm the blooming nervous system of the mine!

The Preparation of Coal

By Gordon Buchanan*

SYNOPSIS—In the last 35 years the preparation of coal in Illinois has experienced several revolutionary changes. Powderless extraction of coal in longwall workings, accompanied by hand screening on forks, has given place to modern methods of undercutting and shooting, with preparations on screens and rescreens and in washers. The author believes that grading will probably be carried as far as in the anthracite region and that the spiral is the best suited coal cleaner for some types of coal. He suggests that a medium size of bituminous coal may possibly soon command a premium in the market.

My experience in coal mining began some 35 years ago when, as a boy, spending my vacations at the mines, my attention was first drawn to the production and preparation of coal. It may not be amiss, to sketch briefly the changes which have come about during the elapsed period.

Reminiscences

I vividly recall the equipment at our old No. 3 shaft, which was no better, and no worse, than those of our competitors. It consisted of one old boiler, which, following its Sunday cleaning, was often the cause of much picturesque profanity on the part of our old Scotch engineer, Andy McKean. It had a practice of squirting so much water through its seams over the fire as to make it an even bet whether the coal could be made to burn or not. Usually the expansion conquered; if not, we shut down until the seams had been calked.

The hoist was a single-cylinder link-motion engine with a flywheel on the shaft, which frequently got on a dead center. Then it became necessary for Andy to walk on the flywheel spokes and "put her over," as he expressed it. There is still current among the older men in the field a tale relating to a similar installation which "ran away" one day, due to the breaking of the throttle valve, whereupon the engineer, during the ensuing excitement, was advised by a friendly Scot to "fling a prop in the wheel, Sandy." The resulting cast-iron shower forever established Sandy's reputation as an artful dodger.

Prior to my time the coal was forked in the mine before loading into pit cars, the screenings being thrown into the gob, and becoming a fruitful cause of trouble through gob fires. The gobbing of fine coal continued long after forking was abandoned. Many a day I puzzled my brain in an effort to provide means to insure the loading out of this fine coal.

During this period railway equipment consisted of ten-ton cars. Later, a certain few of our favored customers were taken over to the old Canal Street station of the Alton R.R., in Chicago, where now stands the Union Station, to see the world beater, a 12-ton coal car. Strange to say, on certain roads the spectacle of a wood-burning locomotive drawing a train consisting of cars of coal was frequently to be seen.

Mining Coal without Powder

Our longwall miners prided themselves on their skill with the pick, striving to make their cuts as narrow and as deep as possible. Explosives were practically unknown. I have known men to go home for several days on a stretch because their coal had not broken, only as a last resort using sledge and wedge to bring it down. It was nothing uncommon for a man to put in 14 hours' work daily, although the mine only hoisted during ten hours. As they expressed it, "they could take their time to it."

Under these conditions few appliances for cleaning the product were necessary. The bar screen set in the bottom of the loading chute between the tipple dump and the car was later supplemented in some few instances by a revolving screen for further sizing of fine coal, and the cleaning was provided by hand picking on the car. These simple methods constituted the sum total of preparation and continued in use for many years.

However, finally, the mine-run system was introduced into Illinois. It brought with it an increased percentage of fine coal, containing a greater proportion of impurities, due partly to the lowering of the standard of skill employed in mining. The miners now loaded out their fine coal which had formerly been thrown into the gob, and this was largely mixed with fire clay. Thus it became necessary to provide new methods of preparation in order to obtain a return from fine coal to offset the loss of revenue due to decreased percentage of lump.

Coal Passing from Tipple to Rescreener on Rubber Belt

This condition was met by the shaker screen containing various-sized performations, which permitted a closer sizing of small coal by a single operation, with delivery direct into cars, thereby eliminating re-screening plants.

Following this a campaign was started to educate the steam consumers for the purpose of creating a demand for the smaller sizes produced. As a result various forms of stokers were introduced and perfected.

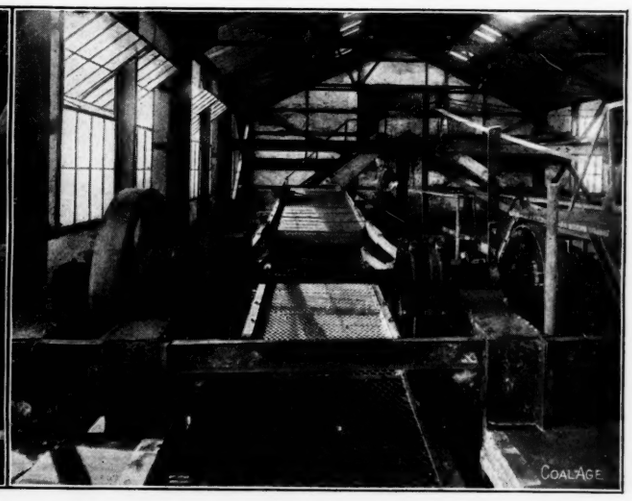
Coal Cleaning

The next problem confronting the producer was that of eliminating impurities, such as clay and pyrites con-

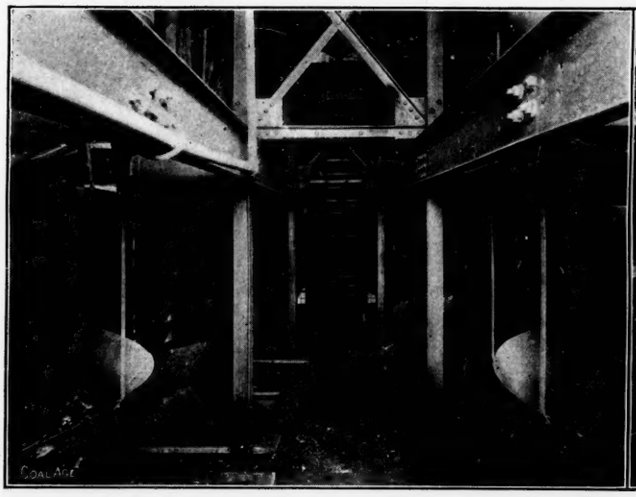
*President, Ohio Valley Mining Co., Chicago, Ill.

Note—An article read May 9, 1913, at the dedication of the Transportation Building and the Locomotive and Mining Laboratories of the University of Illinois, Urbana, Ill.

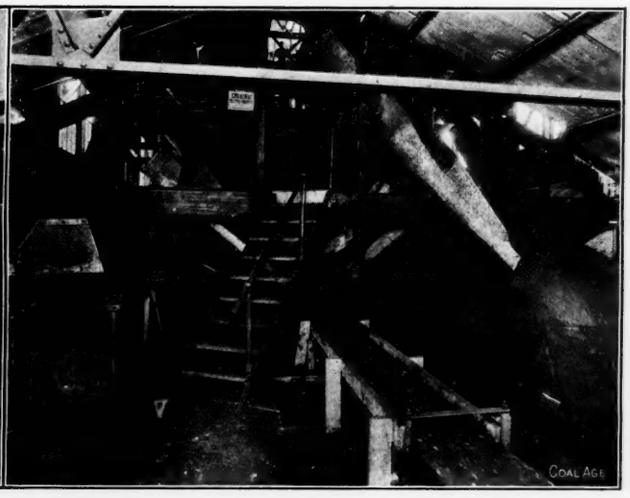
View Showing Actuating Dynamo and Rear End of Shaker Screens



View Showing Where Coal Enters Rescreener and Upper End of Screens

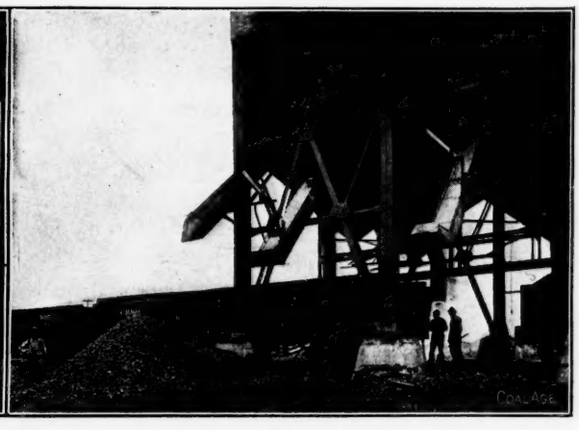


Spirals below the Screens Shown in Previous Figures



First Floor, Showing Bins, Bone and Slate Belt and Spirals

View of Tracks and Underside of Bins beneath Rescreener



Four Hours' Run of Slate Taken from the Coal

tained in the smaller, or steam sizes. These caused clinkers and impeded combustion through clogging of the grates, particularly in the furnaces of the traveling-chain type. Thus was introduced the coal washer in its various forms, which for a time solved the problem. Like all other appliances the washer has its limitations, and must be modified to suit the needs and peculiarities of the coal under treatment.

As perhaps is well known, it will not produce results with all coals; in fact, with some it will not produce results at all and other means must be sought. It has its drawbacks even when it does produce a clean coal. The fuel is prone to freeze in winter, thus causing increased labor and expense in unloading, while in summer disputes are frequent because of the claims for shortage at destination, which our railroad friends are prone to shift over onto the shoulders of the coal-mine operators. The shortage is invariably charged by them to evaporation of moisture and not to any other loss in transit.

Having passed through all these changes in the conduct of the industry in a period of short duration, we quickly realized, on entering the Franklin County field, that while the percentage of impurities, due to difference in mining methods, was relatively less per ton, the increase of output necessary, together with largely increased speed of handling, necessitated some method of preparation in addition to that of screening and hand picking.

In Europe, Coal Preparation is a Leading Problem

The preparation of coal is a subject on which a great deal of thought can and should be expended; yet up to the present, considering the magnitude of the bituminous industry in America, comparatively little has been done. America, unfortunately, is far behind foreign countries in this respect, and we may well take a leaf from their book of experience and profit thereby.

The European coals as a rule, compared with those of America, are poor and the beds thin, consequently, a large amount of care and labor must be expended to prepare them properly for market. In Great Britain the quality of coal is much better; nevertheless a large share of the expense involved in equipping British mines is devoted to the machinery for cleaning and sizing.

Our American coals, as a rule, are of much better average quality than the foreign coals, and have required less attention to prepare them for market. Today competition is such that the preparation often is the determining factor in retention of trade. There is a vast field for improvement in this direction.

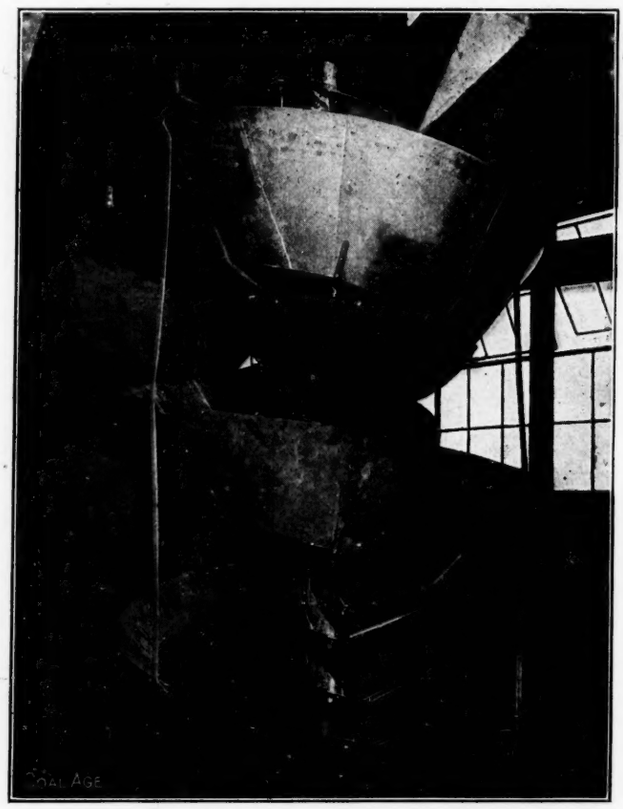
Up to the present time, except as already briefly outlined, not much in the way of machinery to perform this work automatically has been developed for use in the bituminous field, although considerable advance in this line has taken place in the anthracite regions.

Soft Coal of Chestnut Size Should Lead in Price

One of the curious facts in the marketing of coal is that the trade pays a premium for anthracite of certain small sizes, notably chestnut, whereas in the bituminous fields the opposite is the case where at times a premium is paid for the large sizes, the small being frequently a drug on the market. The reason, undoubtedly, for this is the fact that appliances for burning domestic soft coal are not as efficient as those for the consumption of anthracite.

It would, therefore, seem as though there was a large field here for the enterprising manufacturers, who will develop and market, at reasonable cost, devices which are fitted and designed to burn the small sizes of soft coal without smoke. These are now being burned in certain types of house-heating furnaces and boilers, but as yet no practical efforts have been made to apply this principle to the ordinary heating stoves of small size, nor to the cook stoves, which make up the great bulk of the fires fed by soft coal.

Efforts to educate the consuming public to the value of the smaller sizes for domestic use would tend to make for market stability. If this campaign of education is to prove successful, it goes without saying that the fuel used must be closely sized, as clean and as free from impurities as possible. As large tonnages must be produced if operating expenses are to be maintained at a low figure, the old-fashioned methods of preparing coal are unsuccessful through their inability to take care of the volume of coal



One of the Twenty-Eight Spirals by Which Dirt and Low-Grade Coal Are Removed

at the rate of speed at which it must be handled. It is difficult, also, to obtain conscientious labor which will remove impurities by hand, also difficult to obtain labor which can stand the rate of speed necessary for this method of cleaning, and it is impossible to remove all impurities by hand methods.

The Spiral Cleaner

In searching for new ways to improve the quality of our output, our company reached the conclusion that we must look for some mechanical process which would work perfectly at high rates of speed. We, therefore, searched the anthracite field thoroughly, and also examined certain of the foreign fields. We found a number of appliances, all of which had good points, some more and some less than others. For our particular kind of coal, after careful practical tests, we concluded that one certain type of machine would do the work better than others, and we therefore installed it.

The result has more than warranted our belief in its efficiency. It is true that it is not absolutely automatic,

care being necessary to see that it is not crowded beyond its capacity. This particular device utilizes gravity, friction and centrifugal force to separate the slate and bone from the coal. When adjusted to the particular size of coal and fed within its capacity, it automatically rejects slate and bone, delivering the coal in a remarkably pure state. The coal must be first closely sized and delivered to machines built to suit the various sizes. Like all such devices, it has its limitations and probably would not work on all kinds of coal.

It must be apparent to the thoughtful producer that, given a good coal, the successful members of the industry will be those who deliver to the trade, the coals which contain the least amount of foreign matter, and which are the most uniformly sized; those which have, through close study of the needs of the consumer best fitted themselves to know and to advise which coals will give greatest economy under the consumer's peculiar conditions; not necessarily those who sell coal of the lowest price, for in the analysis the intelligent consumer is concerned less with what he pays, than with what he gets for his money.

The producer who delivers a satisfactory product exactly suited to the peculiar needs of his customer, thereby relieving him from the annoyance and loss arising from a fuel unsuited to his needs, surely should, and undoubtedly will, receive the consideration due his forethought and labor.

In conclusion, it seems apparent that more thought and care bestowed upon the preparation of our Illinois coals should result in increased returns, expansion of our selling territory and the establishment of a reputation for quality which should prove sheet anchors during a depression.

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Systematic Operation of Coal Mines

By A. J. Moorshead*

SYNOPSIS—The modern mine fails hopelessly to produce results if not planned and managed with system. But a mere assembling of physical and mental forces, even though grouped with judgment, will not create a successful operating organization without the harmony of effort resulting from the employment of men of strong character and moral force.

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It is vitally important that all corporate operating bodies be efficiently organized. Every phase of the coal business is dependent for its success on the character of the organization of the body conducting it.

But no matter how elaborate may be the framework, how well it may be suited to the purpose in hand, it is valueless unless it works harmoniously. No success can be obtained without harmony and in no business is such coöperation more necessary than in the dangerous occupation of coal mining. Organization and discipline, little as we like the latter, must be linked together if we would conduct any business with success.

Forethought

The conditions of today are such that we cannot hope to succeed by merely meeting each difficulty as it arrives. Modern coal mines must develop a large tonnage and must be conducted in the most efficient manner if any return is to be obtained. Hence, the whole future of the mine must be considered before any action, however unimportant, is taken.

Complete plans must be drawn at the very outset of the enterprise, showing the fully equipped plant both below and above ground. Furthermore, the great need for enough capital to conduct the business without embarrassment, after all the expenditures of purchase and construction are completed, must never be overlooked.

Character

In selecting a working force, mere ability to design the details of operation does not constitute the sole qualification. Supervising officers should add to such ability, the force of character which will impress not only the executive, but the employees. Otherwise they will be unable to control the situation at times when danger is imminent.

Location

All shafts, slopes and drifts should be placed well above the highest flood level, and too much attention cannot well be given to drainage. Reservoirs must be established where not only good boiler water can be obtained, but of ample size to impound sufficient water to take care of the power plant and washer for a period of not less than ninety days, otherwise the colliery will be closed down in times of drought, which occur so often in the state of Illinois. Tracks for railroad cars should be on sufficient grade that both empty and loaded railroad cars may be moved by gravity and should be of such capacity that they will take care of the output of the mine for 12 hours of operating time.

All power and supply houses, machine and carpenter shops, should be ranged on definite building lines and so located that the tracks containing material will be kept out of the way of the operating tracks of the mine.

Supervision

In the arrangement of the underground working forces, the safest and most efficient practice is to have not more than three gangs for work on the roadways—one for track repairs, another for timbering, and the third for keeping the haulageways and air courses clear. To this must be added special organized gangs for any particular class of underground improvements, such as making concrete stoppings.

A gang leader or foreman should have charge of each of these separate bodies. This plan has, in actual practice, been found by far the more economical, both in point of safety as well as in service performed, than the old method of having many scattered gangs working without leaders, and subject only to the infrequent oversight of the mine manager* or his assistants.

One or two inspectors, as the size of the mine may require, should be employed on the day shift to travel the

*President and general manager, Madison Coal Corporation.

Note—Abstract of an address delivered May 9, 1913, entitled "Organization as Affecting Mining," read at the dedication of the Transportation Building and of the Locomotive and Mining Laboratories, University of Illinois, Urbana, Ill.

*The mine manager is in Illinois the certificated officer corresponding to the mine foreman in other states. He is subordinate to the superintendent.

haulageways and air courses for the purpose of inspecting all trap doors, track, switches, electrical circuits and roof. The inspectors should also test the air and locate defective stoppings, as well as watch for reckless drivers. All irregularities found should be reported to the mine manager.

Sufficient assistant managers should be employed. Their duties should require them to visit the faces of the rooms and of the entries only, to see that the ventilation is properly maintained and that all the miners are supplied with sufficient timber and that they are timbering their places adequately for their own safety. They should see that all working places are kept in good condition; also, when necessary, they should give instructions as to the manner in which the faces should be drilled to be shot with safety, and a large size of coal obtained with a minimum of shots.

It is, I believe, a fair statement to make, that in altogether too many mines, the underground managing force is totally inadequate for the number of men employed and tonnage produced, and I have, myself, known of many instances where the mine manager was without assistants, so that he became in fact a mere timekeeper. He seldom saw an air course unless a fall baffled the air and interfered with the ventilation, or visited the face except when some trouble called him there. Wherever such conditions exist, the force is seriously incomplete, and the owner of the property is permitting an unwise economy to be practiced. Leakages and mistakes must in such cases occur, and in an indirect manner the mine owner is losing a far larger sum than the yearly salaries of several assistants.

Drilling and Co-operation

It will be recognized that it is a waste of money to provide equipment without a properly organized, efficient force to handle it, and this is particularly true of fire-fighting and rescue appliances. Each and every man on the surface, and all supervising officers in the mine, as well as all employees working round about and in the vicinity of the shafts in the mine, should not only have specific duties to perform, but should, through systematic drilling, be prepared to act as a unit, because by quick, energetic action, and complete discipline alone, can even a fair degree of success be expected.

Harmony, together with firm and fair discipline, is necessary for the success of all institutions, but more particularly is it essential in coal mining, because most of the men underground are for the greater part of the working time beyond the observation of the managing forces.

No. 2 Mine of the United Coal Mining Co.

By C. M. Moderwell*

SYNOPSIS—The mine at Buckner, Ill., is one of the uptodate mines of which so many are found in Franklin County. The cars are exceptionally large, the boiler equipment will make steam both economically and with minimum labor, and the rescreener makes five sizes of coal.

The No. 2 mine of the United Coal Mining Co. is located about three miles east of the village of Christopher. This location was selected because, while not exactly in the center of the field which is to be developed, it is as near that point as the nature of the surface would permit.

The railroad tracks forming the working yard run in an easterly and westerly direction with the empty storage tracks on the west. The connection from the Illinois Central is made by a spur coming in from the north which forms a "Y" connecting both empty and loaded yards. The Chicago, Burlington & Quincy R.R. comes in from the south in the same manner. The mining plant is located within this double "Y," which makes a convenient arrangement for the handling of empties and loads and also for the receiving of mine supplies. The tracks are equipped with railroad track scales on the empty side and also with a scale for weighing the loads.

The Surface Plant

The mine was planned both above and below ground to produce ultimately 4000 tons of coal in an eight-hour day. The tipple loads onto four tracks and a steel rescreening plant has been built with a bin capacity of 1000 tons and a screening capacity of 1800 tons daily. The steel tipple is complete with weighing, screening and loading equipment. A combined boiler and power plant, including hoisting engines, electrical equipment and water-tube boilers; boiler-house coal conveyor, including overhead steel storage tanks for delivering coal to automatic stokers; ash-handling equipment by means of an ash tunnel under the boilers with steel ash car and hoist for delivering ashes into a hopper located outside of building; the usual repair and blacksmith shops, supply house, etc. There is also an auxiliary air shaft with a separate compartment for hoisting men and material during working hours.

Another Mine (No. 1) of the United Coal Mining Co., Urbain, near Christopher, Ill.

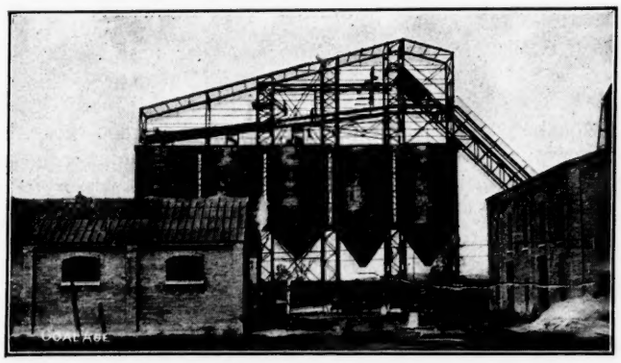
The ventilating plant consists of a Clifford-Capell 8x16-ft. fan housed in steel direct-connected to a Chuse four-valve engine housed in concrete. There is also a complete water system consisting of a reservoir, an electrically driven pump and an elevated steel tank with a distributing system. The entire plant is built of concrete,

*President, United Coal Mining Co., Chicago, Ill.

Note—Paper read at the meeting held May 8, 9 and 10, at the dedication of the Transportation Building and Transportation and Mining Laboratories, University of Illinois, Urbana, Ill.

steel and brick construction and is as near fireproof and permanent as possible.

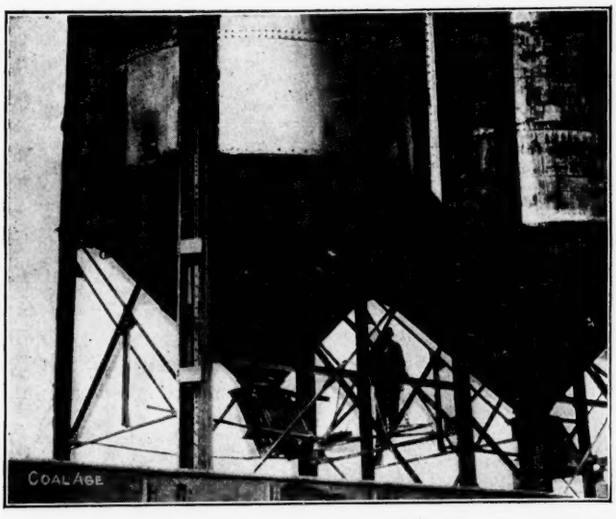
The mine is laid out underground to fit as nearly as possible the conditions found in the No. 6 seam in Franklin County. It is being worked on the panel system and it



THE BUCKNER RESCREENER IN COURSE OF CONSTRUCTION

is proposed to take the pillars on retreat. The seam of coal averages about 10 ft. in thickness and about 2½ ft. is left up for roof support in the first mining. This top coal is taken down when the pillars are drawn.

As the Franklin County field is comparatively new, the experience of the operators in that field does not permit of a statement as to the amount of coal recovered, but it is supposed that the total recovery will be about 80 per cent. of all the coal in the ground. If commercial conditions justify, it might be possible to recover more of the coal.



SHOWING NOVEL ARRANGEMENT FOR REMOVING COAL FROM BINS WITHOUT BREAKAGE

The mine at the present time is producing about 2500 tons per day, but has something like 200 rooms turned which are available for quick development.

The landing underground on the loaded side is equipped with a Jeffrey car haul which brings the trip down to an automatic car stop which releases the cars one at a time as they are caged. The main haulage roads are laid with 50-lb.; the cross entries with 30-lb. and the rooms with 20-lb. steel. A four-ton car is used and the mine is equipped with electric motors for both haulage and gathering. Overcasts are built of concrete-steel construction and permanent stoppages are built of brick.

The life of the mine is estimated at 30 years and in that time it is expected that about 1500 acres will be worked out. On the basis of 200 working days, it is expected the ultimate capacity of the mine will be 700,000 to 800,000 tons per annum.

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Illinois Mining Conference at Urbana

On Friday and Saturday, May 9 and 10, an interesting conference was held at the University of Illinois, Urbana, Ill., following the dedication of the Transportation Building and the Locomotive and Mining Laboratories. During this conference, the following program was carried out. On Friday, May 9:

"Conservation and Commercialism," by Francis Peabody, president, Peabody Coal Co., Chicago, Ill.; "Organization as Affecting Mining," A. J. Moorshead, president, Madison Coal Corporation, St. Louis, Mo.; "Illinois Mineral Producers," E. W. Parker, chief statistician, U. S. Geological Survey, Washington, D. C.

Prof. H. H. Stoek, acting as chairman of the conference, suggested to those attending the meeting that it might be beneficial to the coal industry of the state if more frequent meetings of this same kind were held at stated intervals. A short discussion followed this remark from the chair, and it was resolved that the chairman appoint a committee to consider ways and means for the formation of an Illinois mining institute. Prof. Stoek called the newly appointed committee together in the afternoon, and the following organization was effected: J. D. Peters, general manager of the Chicago-Carterville Coal Co., Herrin, Ill., chairman; Martin Bolt, chief clerk of the State Mining Board, was elected secretary of the committee. The first regular meeting of the full committee was called for June 24, at Springfield, Ill. All suggestions concerning the formation of this proposed Illinois coal-mining institute should be forwarded to Mr. Peters at Herrin, or to Mr. Bolt at Springfield.

At 8 p.m. in the evening, the following topics were discussed:

"The Preparation of Coal," by D. W. Buchanan, president of the Bituminous Coal Washing Co., Chicago, Ill.

"Safety First." (a) From the Standpoint of the Miner, Joseph Pope, president of the United Mine Workers of America, District No. 12, Springfield, Ill. (b) From the Standpoint of the Operator, Thomas Moses, general superintendent of the Bunsen Coal Co., Westville, Ill. (c) From the Standpoint of the Mine Inspector, John Dunlop, state mine inspector, Peoria, Ill. Also a discussion of this topic led by Martin Bolt, chief clerk of the State Mining Board, Springfield, Ill.

"Modern Practice in Illinois Mines, as Illustrated by Some Recently Developed Mines." (a) The Buckner Mine, C. M. Moderwell, president United Coal Mining Co. (b) Cedar Point No. 5 Mine, C. C. Swift, general superintendent, La Salle County Carbon Coal Co., La Salle, Ill. (c) Saline No. 3 Mine, W. R. Johnson, general superintendent, Saline County Coal Co., Harrisburg, Ill.

On Saturday, May 10, the general subject of the conference was "Fireproof Mine Construction," and the various topics discussed were:

"Concrete in Mine Construction," by S. F. Allard, chief engineer of the Bunsen Coal Co., at Westville, Ill.

"Steel in Mine Construction," by Carl Scholz, president, Coal Valley Coal Co., Chicago, Ill.

"Modern Steel Tipple Design," by John A. Garcia, of Allen & Garcia, McCormick Bldg., Chicago, Ill.

"Fire Protection of Mines." (a) From the Standpoint of the Mine Operator, John P. Reese, general superintendent, Superior Coal Co., Gillespie, Ill., and Walton Rutledge, state mine inspector, Alton, Ill. (b) From the Standpoint of the Miner, Duncan McDonald, secretary of the United Mine Workers of America, District No. 12, Springfield, Ill. (c) From the Standpoint of the Mining Engineer, G. E. Lyman, mining engineer, Madison Coal Corporation, St. Louis, Mo.

The subject was then presented, "The Fireproofing of Mining Plants," by H. M. Wilson, chairman of the Mine Committee of the National Fire Protection Association.

Illinois as a Mineral Producer

By E. W. Parker*

SYNOPSIS—Illinois enjoys the unique distinction of having the center of mineral production for the United States within her boundaries, and ranks second among the producing states. Although exceeded by West Virginia in coal tonnage produced, the gross value of Illinois output is the greater.

A general but somewhat erroneous idea prevails that the Rocky Mountain and Pacific Coast States are our mining states, probably because the bulk of our supply of precious metals and the larger part of the output of copper comes from that portion. The fact of the matter is that fully two-thirds of our mineral production comes from the states east of the Mississippi River, and these Eastern States constitute only a little more than one-fourth (28.8 per cent.) of the total area of the United States, exclusive of Alaska and our insular possessions.

The center of mineral production, determined in the same manner as the Census Bureau arrives at the center of population, is located in this state of Illinois—in Cass County, about 90 miles north of St. Louis and 50 miles east of Quincy. The rank of Illinois as a mineral-producing state depends upon whether we consider iron ore or pig iron as the basis of iron production, but in either case it ranks among the first three or four. As you all well know, Illinois is not a producer of iron ore, the furnaces here obtaining their supplies of ore from the Lake Superior region, but Illinois is one of the three leading states in the manufacture of pig iron, being exceeded in this respect by Pennsylvania and Ohio, both of which produce some iron ore, but depend upon Lake Superior for by far the larger part of their supplies.

In 1911, with pig iron as the basis of production, Illinois had a total output valued at approximately $137,400,000 and was third in rank, with Pennsylvania first and Ohio second. If we substitute iron ore for pig iron in our statistical compilations, the value of Illinois' production drops to $106,230,000, but Ohio takes a bigger drop to less than $100,000,000 and Illinois comes second as a mining state and without reflected credit from the manufacture of ore mined in another state.

Illinois owes its high rank among the mineral-producing states principally to the extensive development and intelligent utilization of the coal resources with which she has been so bountifully endowed. The state has 102 counties, and coal is mined in 51 of them, which is more than in any other state in the Union, not excepting Pennsylvania. In point of coal tonnage Illinois has been exceeded in the last three years (that is 1909, 1910 and 1911, the figures for 1912 not being available) by West Virginia, but in point of value Illinois continues to lead. In 1911 West Virginia's coal production exceeded that of Illinois by over 6,000,000 short tons, whereas in value the output of Illinois was the greater by nearly as many dollars ($5,840,000). The cause usually assigned to this is that the cost of mining per unit of output in Illinois is higher than in "unorganized" West Virginia and this is doubtless true to some extent, but compensation for this condition is secured through the relatively local markets with which the operators of Illinois are blessed.

This state ranks third as a manufacturing state, with New York first and Pennsylvania second. West Virginia, her close and for the last three years her successful rival in coal production, is of relative unimportance as a manufacturing state (ranking twenty-ninth) and must seek an outlet for her coal in distant markets. All of the coal production in Illinois, on the contrary, is consumed within her boundaries or in immediate adjacent territory, and, relieved of long distance rail haul, the trade can bear within limits, a higher cost of production. No person here present, nor any one familiar with the quality of the coal produced in the United States, will claim that the average of Illinois coal is of as high quality as that of West Virginia's product and yet in 1911 the average value per ton at the mines was $1.11 for Illinois coal, and 90c. for West Virginia. In 1910 the corresponding values were $1.14 and 92c. The moral is obvious. Use your raw material at home.

In addition to consuming her own coal, Illinois uses large quantities of the West Virginia product, and some from Pennsylvania and Kentucky. Within the last two or three years, owing to the construction of large by-product coking ovens at Chicago and Joliet, Illinois has pushed to the front as a manufacturer of coke, but the greater part of the coal used (fully 80 per cent.) comes from West Virginia. Some of the Illinois coals possess coking qualities, but do not make satisfactory furnace coke. An entirely satisfactory coke is made at Joliet, using a mixture of 80 per cent. West Virginia and 20 per cent. Illinois coal.

Of the 51 counties in the state, two (St. Clair and Williamson) produce over 5,000,000 tons each; two others (Madison and Sangamon) produce over 4,000,000 tons, and several others produce from 1,000,000 to 3,000,000 tons. These are large figures, but shrink in comparison with two counties in the bituminous region of Pennsylvania, Fayette and Westmoreland, whose combined tonnage equals that of the entire state of Illinois and with two others, Luzerne and Lackawanna, in the anthracite region with about the same aggregate output. But then Pennsylvania's total production of anthracite and bituminous coal is four and a half times that of Illinois.

Second in importance among the minerals of Illinois is petroleum, the development of which in significant quantity is part of the history of the last decade. Prior to 1905 the petroleum production of Illinois was measured in hundreds of barrels; it is now reported in tens of millions. They "struck oil" in Illinois in 1905, and in the following year the wells yielded nearly 4,500,000 bbl., jumping to nearly 25,000,000 in 1907, since which time the production has been between 30,000,000 and 35,000,000 bbl. annually.

Illinois now exceeds both Pennsylvania and West Virginia in the production of petroleum and is indeed the leader in this respect among the states east of the Mississippi River. It ranks third among all of the states, be-

*Statistician, the U. S. Geol. Survey, Washington, D. C.

Note—Abstract of an address delivered at the dedication of the new buildings at the University of Illinois.

ing exceeded only by California and Oklahoma. Natural gas is produced in Illinois, but in relatively small quantities, and is used principally locally. The production of gas is valued at only approximately $600,000 per annum.

As stated earlier in this discussion, the manufacture of pig iron is not included in the mineral industries of the state, as it is not based or dependent upon the development of natural resources within the state, but it is a manufacturing industry of large proportions and deserves special mention. As a manufacturer of pig iron, Illinois ranks third among the states, the total output in 1911 (an "off" year in the iron trade) being valued at over $31,000,000. In 1910 when conditions were more nearly normal, the pig-iron product of Illinois was worth $41,500,000.

In 1910 Illinois produced 2,688,000 long tons of steel ingots and castings. In 1911 the production decreased 550,000 tons. This was due to the general falling off in iron and steel production in that year. As in the manufacture of pig iron, Illinois ranks third in the production of steel ingots and castings, although now rather closely pressed by Indiana, whose production of ingots and castings amounted in 1911 to about 1,600,000 tons.

Excluding pig iron from consideration, Illinois stands second in the 50 states and territories comprising continental United States, and contributes one-sixteenth to the annual mineral production.

Steel in Mine-Construction Work

By Carl Scholz*

SYNOPSIS—The author believes that the future will bring an increased use of steel in mine work. Steel construction, if not too heavy, is as cheap as wood and pays even where temporary. Steel tipples can be moved to new locations when the coal is exhausted. A description is given of a shaft which was cheaply lined with steel and concrete.

The tendency to secure greater safety and the development of mines, larger and of longer life, have brought about a change in the character of the material used for construction purposes, both above and below ground. Up to a comparatively short time ago, wood was used entirely for the construction of coal tipples, head frames, and buildings on the surface; the only metal used was for the screens, which were of simple design and usually only planned for a single separation. Already, however, wooden tipples are no longer built, except for small country mines, and steel and concrete are used almost exclusively for the surface plants.

No. 1 Plant Consolidated Indiana Coal Co., Dallas, Ind. An Escapeway Is Being Constructed on the Right on a 17-Deg. Slope, by Which Men Will Enter Mine. No Men Will Be Hoisted

Light Steel Tipples as Cheap as Wooden Construction

Steel tipple construction has undergone a very satisfactory change during the last ten years; prior to that time the steel tipples were clumsy imitations of the wooden structures and were built without consideration of the correct strength and location to secure the best results. The earlier tipples were much too heavy. Usually, 12-in. double-channel columns, elaborately laced, were used to take the place of 12-in. square timbers. This made a structure strong enough to raise a heavy locomotive, and the resulting cost prevented extensive adoption of steel tipples.

With modern engineering, however, a properly designed steel tipple is no more expensive than a like wooden structure of equal strength and it has so many advantages that there can be no question of the advisability of replacing wood by steel. The elimination of fire risk alone is of much importance, not only on account of the saving in insurance premiums and possible property loss, but because of the further injury to business should a fire occur in the rush season. Owing to fires for heating purposes being used during the winter months when business is most brisk, more conflagrations occur during the busiest period of the year than during the summer. The use of steel tipples enables the designer to place the supports some distance away from the shaft, and the "A" frame type has become popular and is extensively used. With a tipple of this design the wear of the shaft lining does not affect the structure because the supports are not weakened by the deterioration of the shaft. Even caving would not affect the supporting foundations.

*President, Coal Valley Mining Co., 144 Van Buren St., Chicago, Ill.

Note—Paper read on May 9, 1913, at the dedication of the Transportation Building and the Locomotive and Mining Laboratories of the University of Illinois, Urbana, Ill.

Where fireproof shafts are used, the three-leg tipple, which has been exploited by a Chicago engineering firm, can be used advantageously and at a minimum cost. The figures accompanying this article show different views of one of these tipples which is now being erected.

A Steel Tipple Can Be Re-erected in a New Location

Within the last two years I have developed two new mines, both of which will have a life of approximately ten years. One was a shaft mine and was equipped with a steel tower, bolted so that upon extraction of the coal, it can be taken down and removed to another location. In its present installation only three tracks were needed for the preparation of the coal, but the tower was built for a four-track tipple, which may be wanted at the second location.

The second mine was entered by a slope, and since it is expected to be the last slope mine which our company will develop and there would be no further use for the bents, wooden construction was adopted. Thirteen months after this mine began operation, the tipple was destroyed by fire, and the resultant losses would have paid for the steel construction even though it would have been wasted entirely upon the extraction of the coal at this locality.

The other buildings on the surface, and particularly the boiler and engine houses, must be fireproof and much steel and iron is used for this purpose, particularly siding, roofing and roof trusses. The contents of these buildings are nearly all steel and iron.

Use of Steel in Shafts

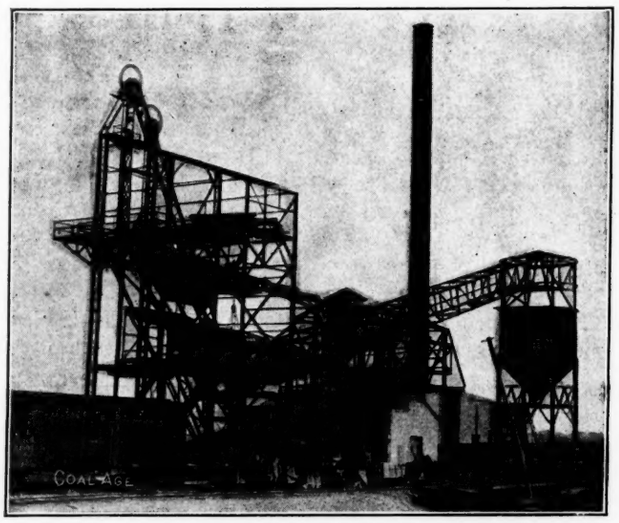
Fireproofing of shafts is regarded as important for safety, and many state laws require such construction. In large and important mines a permanent shaft lining is desirable because only by this means can delays due to frequent repairs be avoided. Steel frames similar in design to wooden sets for two- and three-compartment shafts have been installed with steel sheeting as lagging. This construction, however, is expensive and has not met with much favor.

I recently designed a modification of a steel shaft lining and it is installed at Shaft No. 1 belonging to the Consolidated Indiana Coal Co. and located at Dallas, Iowa. The arrangement of steel in this design provides for the principal members to be placed vertically instead of horizontally, as is the case when timber is prefered. Eight I-beams are used—four near the outside corners of the cages, two in the center of the cages and to these the buntons are fastened, and two on the sides to which the outside guides are attached. The shaft is of elliptic cross-section. The height of the I-beams ultimately forms the thickness of the concrete lining. In sinking, they are fastened together on the outside with curved angle irons bolted to their flanges, spaced about 5 ft. apart, and thin lumber lagging is used to prevent the caving of material.

When the bottom of the shaft is reached, the concrete is put in from the bottom to the top by clamping short form panels to the inside flange of the upright I-beams. These inside forms are made from 3 to 5 ft. in height, and ordinarily two sets are sufficient to enable concreting to progress continuously, the sets being used alternately. In the Dallas shaft this wall is made 7 in. in thickness and the outside lagging was left in place, with openings at intervals to permit the concrete to tie firmly into the rock surrounding the steel frame. The advantage of this steel and concrete combination is that the fabricated steel can be put in with very little expense and without the employment of skilled labor. Sections are bolted together with fish plates, and each section is made self-supporting by having a brace riveted to the outside of the I-beam, which rests in the rock or is supported by a shore or prop safely embedded in the shaft wall.

System which Makes Steel and Concrete Lining Cheaper than Wood

By this means not much attention need be given to the plumbing of the shaft as it is sunk, because the steel frames can be shifted into the proper position as the concrete is placed. The old method of putting in con-



Plant Being Constructed for Consolidated Indiana Coal Co., Dallas, Iowa

crete shafts by the use of wooden forms is complicated and requires much skilled labor and involves delay, because the forms must be very carefully set before the concrete is poured in order to have the required alignment for guides and buntings. In the Dallas shaft the vertical I-beams were made in 15-ft. sections, and in soft material a blind ring slightly larger than the completed shaft was used to permit lagging down to the very bottom of the excavation. Whenever the proper depth was reached and permanent steel frame was installed, the temporary rings were removed and the lagging adjusted itself to the permanent belts.

The weight of material in this construction, including 45-lb. steel rails for guides and the ¼-in. reinforcement rods six inches apart, is about 165 lb. per foot of shaft, and is less costly than the amount of lumber required for the same strength. In other words, what has been proven in tipple construction also applies to shaft lining. The method of lining a concrete shaft from the surface downward is as reasonable as would be the construction of a chimney from the top down.

The Steel Tie

In the mine workings proper, steel is used for various purposes. The oldest and most extensive application is for rails on the haulageways. Formerly wooden rails were used exclusively and on the more important roads iron

straps were placed on the upper surface. Later, 8- and 12-lb. iron rails were used, but with the increased weight of cars and motive power the important entries are now laid with 50- and 60-lb. steel rails bedded in rock ballast. Steel ties are becoming quite popular, and while at first thought, the expense seems prohibitive, considering that a steel tie for a 36-in. gage costs about 35c., whereas a wooden tie costs about 7 or 8c., the saving in wages and the reduced number of ties which are then required make steel more economical than wood under certain conditions.

Where the mine bottom is hard, steel ties can be spaced from 4 to 6 ft. apart enabling the base of the rail to rest on the floor and thus carry the load. The ties principally prevent the spreading of the track. The reduction in height required is important in low beds, and the ability to use steel ties over and over again with very little cost for recovery makes the steel ties more economical than wood.

Miscellaneous Use for Steel

Steel I-beams have been used for many years around shaft bottoms and on partings where wide entries have to be maintained, but the use of specially made steel props and cross-bars is of more recent adoption. Special H-sections have been made and found to be economical under certain conditions. The greatest strength of steel results in the use of smaller sizes which require less excavation for the same finished clearance, and the saving of wages in bolting these sets together, as compared with the costly preparation of timber, brings down the first high cost of the steel frames.

The rapidly increasing cost of timber and the damaging effect of mine air which results in dry rot warrants the investigation of these frames in many localities. Practically all of the underground equipment has been changed to steel, including mine cars, which formerly contained much wood. Locomotives have replaced animal power, and there is no part of the mine operation into which steel does not enter to a greater or lesser extent, beginning with the tools with which the coal is brought down.

Steel is now used in the cars into which the coal is loaded, in the track over which it is hauled, in the steel rope by which it is hoisted, and in the surface buildings which are used for preparing it: and yet twenty years hence we will see more new uses for it than have been found in the last twenty years.

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Fire Protection Above and Below Ground

By G. E. Lyman*

SYNOPSIS—A summary of the methods used in fireproofing mines. The Illinois laws relative to the fire menace are perhaps as strict as any, but the author believes that they do not cover all the precautions which should be taken.

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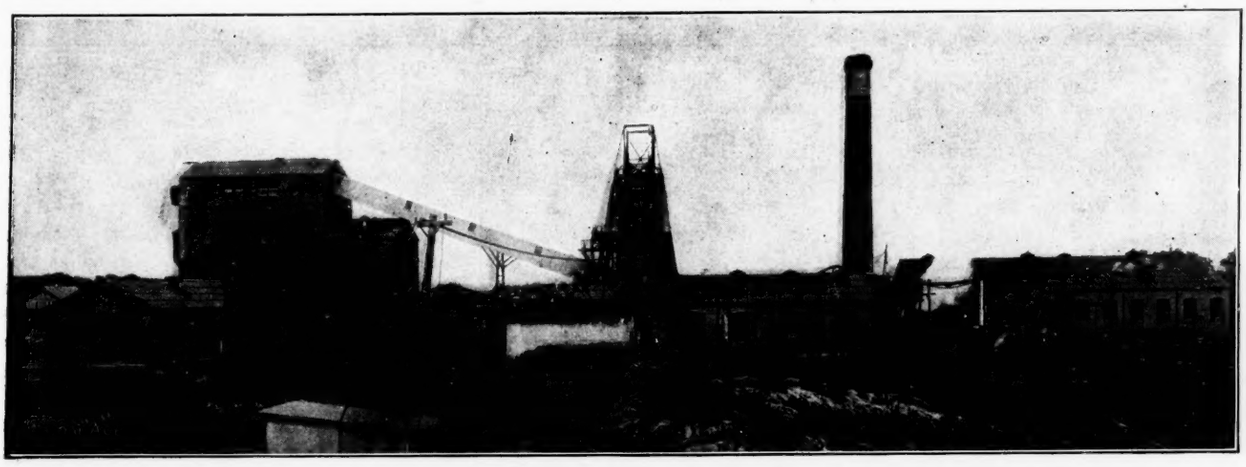
The broad, humanitarian features involved in fire protection will alone make the question command the earnest attention of all, and the engineer realizes that every step taken in this direction is not only in keeping with the spirit of the day, but is a policy that pays well in dollars and cents.

If there is any line of effort in which the energies of the mining engineer should be especially centered, it may be said to lie in these directions:

1. The adoption of every possible means of preventing a fire getting started, both above and below.
2. The planning and installation of the best and most complete fire-fighting equipment possible to obtain, including every available provision for rescue and escape, so frequently needed in fires below.
3. The organization of a competent fire-fighting corps, whose discipline and efficiency shall be maintained by frequent practice.



The Fireproof Plant of the Ohio Valley Mining Co., West Frankfort, Ill.

The labors of our commission for the revision of the mining law have given Illinois some advanced legislation in this direction, making compulsory many preventive measures in new developments, and the installation of certain fire-fighting equipment in old mines. The con-

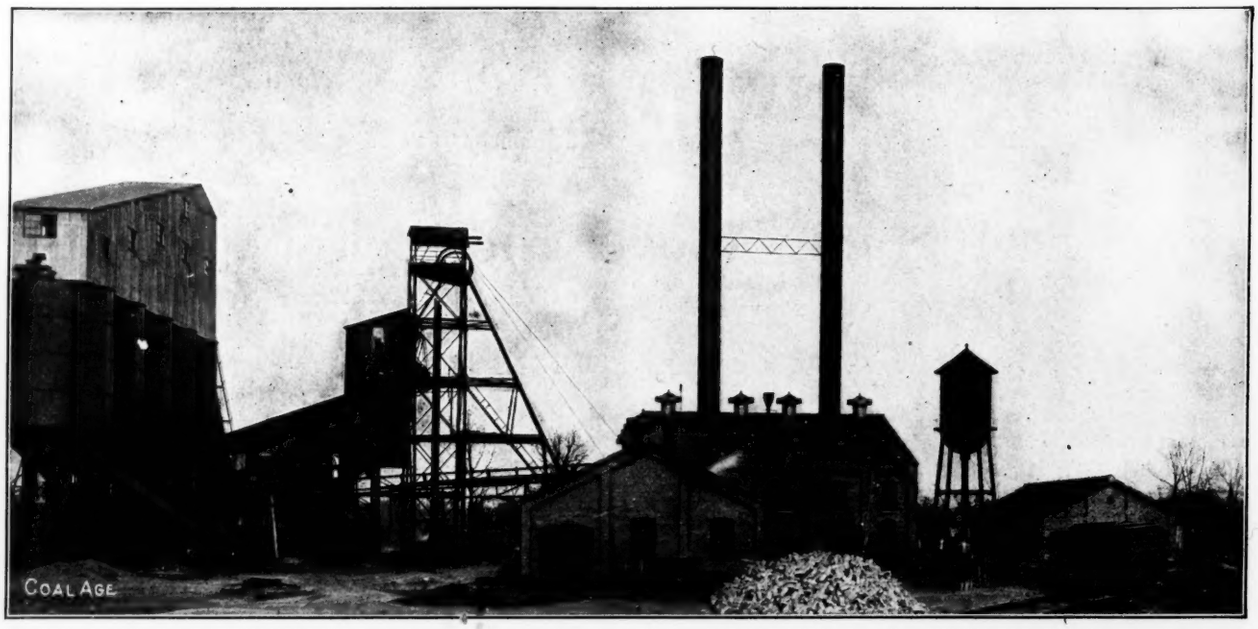
*Mining engineer, Madison Coal Corporation, Glen Carbon, Ill.

Note—Paper read on May 9, at the dedication of the Transportation Building and the Locomotive and Mining Laboratories of the University of Illinois, Urbana, Ill.

scientious engineer will recognize that no statute, however broad, can take care of every detail in widely differing conditions of operation, and after satisfying himself that the law is fully complied with, he will make a further careful study of the individual conditions to be met and endeavor to provide such additional safeguards as he can devise for the better protection of life and property.

Fireproofing at the Surface

One of the first things he would consider in planning the surface plant of a new development would be the design of fireproof structures throughout, making them of brick, masonry or reinforced concrete, with modern structural-steel tipples, making the floors of these, as well as the bin linings, concrete or some equally fireproof material, so that it would be well nigh impossible for a fire to occur on the surface.



The Buckner Plant of the United Coal Mining Co. Is Completely Fireproof above Ground and a Model of Incombustibility Underground

The fan would be housed in such a manner as to have nothing inflammable about it, outside of the oil in the journals, and would be set back a sufficient distance from the shaft to eliminate chance of injury, even though the entire shaft lining should be burned out. The boiler and power houses should be fireproof throughout, so that they could be operated if every other part of the equipment is involved in a fire.

However thoroughly fireproof the plant might be considered, it would yet be the part of wisdom to install a water system with an ample number of fire plugs at convenient points in and about the buildings, with hose connected ready for instant use. Some of the most disastrous fires have been where the contents of fireproof buildings were consumed.

In handling an old plant, the need of the water system just mentioned is doubly apparent, and altogether too obvious to require comment. Regular fire drills and the actual use of the equipment at frequent intervals are essential to its maintenance in proper condition. If possible the system should be connected to a power pump, as well as an independent gravity head, so that it may be thoroughly reliable.

In certain places like wooden fan houses and tipples, means of flooding the structures through automatic sprinklers, as well as perforated pipes handled by valves outside the buildings, may save great losses. The value of steel doors to cover the shafts in case of fire is too obvious to dwell on at length.

The practice of allowing waste and other such material to accumulate is extremely dangerous, and the time required in frequent inspections with the idea of eliminating this practice is well spent. The condition of the electrical wiring, above and below, and of the cables in the shafts, is important.

Fire Protection in the Mines

Within the mine itself much can be done toward preventing fires by the elimination of everything combustible as far as possible, especially around the bottom and in the stables, oil houses, etc. The replacing of heavy lagging and timbers near the bottom, and in permanent entries, with steel and concrete, will be a matter of economy in maintenance in a property of long life, which will justify the expenditure required entirely aside from its value in eliminating the chance of fires. Such work is required by the Illinois law in new mines, within a certain area near the bottom, but its application to a modern mine can be economically extended much further.

The fireproofing of the shafts is a wise requirement, and one entirely in keeping with modern development.

The fires which cause great loss of life below generally involve the fan house, tipple, shaft linings, stables, or other like critical points. Owing to their volume and fierceness, these fires poison the entire mine atmosphere so rapidly as to render it difficult to get the men out. Here is where the value of good fire-fighting equipment, backed up by organization and discipline, becomes apparent. The first few moments are vital and in ninety-nine times out of a hundred, an organized force,

not allowed to grow stale through lack of practice, can quickly extinguish a blaze at the start. In fires of this character the value of adequate and well maintained escapement ways becomes apparent, and they should be made familiar to the men by requiring them to travel frequently through them.

The writer is a firm believer in the value of perforated sprinkling pipes in the stables and other critical points. These are operated by outside valves and are installed in addition to the automatic sprinklers required by law.

The water supply for the underground system should be not only connected to a standing head on the surface as required by law, but also to the pumps on both surface and bottom, so as to provide for all possible emergencies.

TIPPLE OF CHICAGO, WILMINGTON & VERMILION COAL CO., FIVE MILES SOUTHEAST OF CHRISTOPHER, ILL.

FIRE IN THE COAL

Where the coal seam itself is of such a character as to fire easily, a special study of conditions will be necessary to determine the most practicable precautions to take, and the details of such special methods of shooting, caring for machine cuttings, gob, etc., as may be determined therefrom, must be most rigidly enforced by the management. Fires on the inside, such as gob fires, both local and extended, and fires of the seam itself, generally offer less danger to life than to property, although the dangers to be encountered by the limited number who attempt to control them are often of the gravest character.

Opinions as to the proper methods of attacking such fires differ widely, and their discussion cannot properly be attempted here, but as to the necessity of the best and most complete equipment for handling them, there is no room for argument. Every mine should have available in addition to the usual small chemical extinguishers a couple of large capacity mounted on trucks, which can be rapidly taken to the scene of action.

Iron dump cars, to be used in loading out a fire and disposing of it in that way, form useful equipment, and during ordinary operation can be used to advantage in handling dirt and refuse from roads and air courses, so as not to be idle capacity.

When pipe lines run over the mine extensively, as in cases where long-distance pumping is done from many sumps, it is an easy matter to arrange the connections so that the pump pressure can be turned into the suction lines. The writer has seen this done to most excellent advantage, and is a firm believer in its desirability. In cases of sufficient emergency, even air transmission lines may be thus pressed into service.

Oxygen helmets will often enable explorations of a fire territory to be made that could not be attempted otherwise, and may even permit of taking lines of hose or chemical extinguishers to the very seat of the trouble. It becomes necessary, therefore, for any mine desiring the most adequate fire protection to have its own equipment of helmets, pumps, supply tanks and all accessories, including pulmotors and first-aid supplies. The time lost in getting one of the state rescue cars on the ground may allow the fire to make such headway that nothing but walling off the territory can be done.

The saving to a company in a single bad fire alone could easily pay for the cost of its own rescue station and helmet equipment, while a group of mines operated by individuals could divide the expense of a common station between them and make the burden very reasonable. Their object would not be to supplant the state rescue cars in any sense, but merely to take advantage of the first vital moments, and often by such action not only avert a serious calamity, but nip in the bud what might otherwise develop into a difficult and dangerous job for the state corps. Such individual stations would, of course, be in charge of competent men who had received thorough training at the state stations.

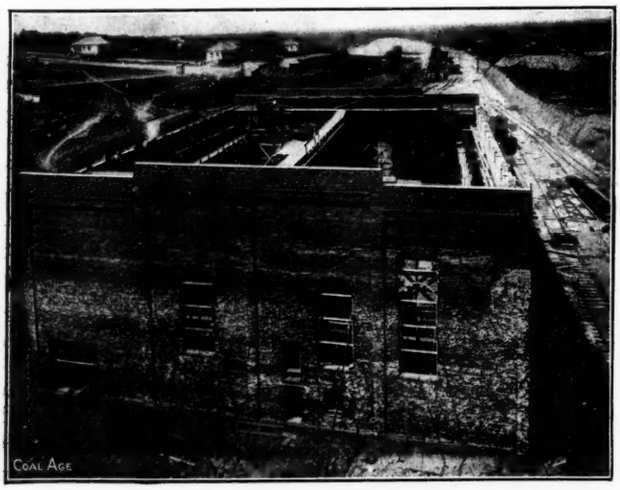
A frequent and often serious source of trouble in fighting large fires in the workings is the lack of accurate maps, and the consequent difficulty of determining the best way of walling off the territory affected. Only too often it happens that some unrecorded opening into the fire area supplies air sufficient to keep it alive, and at the same time is very difficult to locate. An accurate map would indicate at once the best way to wall off the fire and lose the least amount of territory thereby.

Where companies maintain their own engineering departments, this question of maps should, of course, give no trouble. But where it is the practice to have an outside surveyor extend the map annually to comply with the law, accuracy in details cannot be expected. Granted that the man doing the work is thoroughly competent, there will be portions of the mine inaccessible to survey. Accurate, detailed mapping requires frequent extensions, and the remedy for individual operation is for a few to

combine to secure the exclusive service of a competent engineer, and furnish him adequate help and facilities for handling their work in a manner commensurate with its importance.

Even where an adequate engineering department is maintained, and frequent map extensions made, places will frequently be found which cannot be entered for survey. The writer's experience has indicated that this situation can best be met by a system of monthly or semi-monthly reports, showing the length of every working place which has been closed since the last report was rendered, the number of cross-cuts right and left, and other pertinent information.

I do not allow these reports to be used in extending maps unless the engineers are unable to enter the place and measure it themselves. In such cases the desired information is obtained from the reports, and the place shown on the maps in dotted lines, thus differentiating it sharply from the work of the engineering department, and placing before the mine management a visible re-



THE LARGE FIREPROOF POWER HOUSE OF THE CHICAGO, WILMINGTON & VERMILION COAL CO.

minder of their responsibility for that portion of the map.

As the average number of places closed monthly in even a large mine is not great, it consumes little time to handle the report carefully, and the writer has found that it is possible to bring about a feeling of joint responsibility for this part of the work with the mine management which is helpful in many ways.

ISOLATING FIRES

There are few room-and-pillar mines which cannot be advantageously worked on the panel system, or some modification of it, which will permit the walling off of any fire territory with the least possible disturbance to the balance of the mine. The importance of having the maps show faithfully every connection between adjacent panels is obvious, and in the modern mining organization no departure in developing the mine should be permitted from the projections furnished to the mine manager for his guidance, unless the matter is properly considered and authorized by the main operating authority.

It is not uncommon to see a mine entirely, or nearly shut down on account of a fire which should ordinarily have been closely confined in its effects, and this is due to having the workings so cut up that isolation is difficult, and the ventilation hard to control. I believe that the main air courses in either direction from the shaft bottom out to the limits of the workings should be considered just as important as the shaft itself, and be just as carefully maintained. This, in connection with a powerful fan, will enable the circulation of a great volume of air at comparatively low velocity and pressure, which will permit a considerable increase in the number of splits, thus reducing the amount of territory affected by a fire in any one portion of the workings.

The maintenance of an abnormal amount of ventilation is not advocated, but the use of main air courses of more than ordinary capacity and excellence is strongly urged, so that the ventilation of the side entries can be treated as individual problems, as much air being diverted into each one from the main air courses—the arteries, so to speak, of the mine—as its individual requirements may demand.

With this method of ventilation established, there should be small necessity of ever sealing up more than one entire cross entry at the most. There are probably very few of us who have not known of instances where large mines were ventilated on two or three splits, and where a comparatively small fire caused the sealing off of perhaps half the workings.

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Illinois as a Coal Producer

BY A. J. MOORSHEAD*

It recently became my duty, on account of prospective legislation, to prepare statistics to show the coal tonnage produced in Illinois and the service it required from the railroads.

OUTPUT OF COAL IN ILLINOIS, 1912

For the year ending June 30, 1912, the coal mines of Illinois produced	57,514,240	tons
Of that amount, there was used for power and wasted at the mines	2,471,326	tons
Taken by railroad locomotives at mine chutes	924,854	tons
Sold to the local trade at mines	2,615,678	tons
Leaving a total to be shipped in cars	51,502,382	tons

Which, on the basis of 46 tons to the car, would require 1,120,000 cars to move the product.

Such figures in these days, when we commonly reckon, nearly everything in millions, do not seem great or astonishing, but when we couple the 1,120,000 cars together and figure them as averaging 40 ft. in length, we have a string of loads approximately 8500 miles long, and that equals one-third of the circumference of the earth. Or, in order to describe further the length of that train of cars I might note that it would reach from New York to San Francisco and back, and there would still be enough loads left to reach from Omaha, Neb., to Chicago, Ill., and from there to New Orleans, La., via the Illinois Central R.R.

It will be furthermore interesting for you to learn that on the basis of 75 empty and 35 loaded cars to the train, carrying 40 tons each, it would require nearly 43,000 trains to market the production of the mines of Illinois for this one year only.

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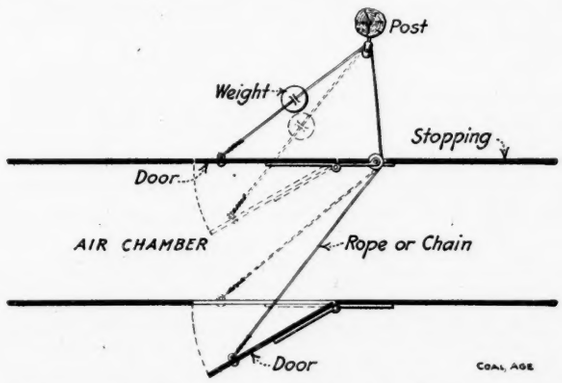
*President and general manager, Madison Coal Corporation.

Note—Preamble of an address delivered May 9, 1913, entitled "Organization as Affecting Mining," read at the dedication of the Transportation Building and the Locomotive and Mining Laboratories, University of Illinois, Urbana, Ill.

Keeping the Doors Closed

A novel method of keeping one door closed when the other is opened in an air chamber at the head of an exhaust shaft has been adopted at a mine in Roslyn, Wash.

Both of these doors, which are on opposite sides of the air chamber, swing on their hinges in the same direction. A chain or rope is fastened to the first door on the side opposite to the way in which it opens, passes around a pulley attached to a post, thence through a suitable opening in the stopping, and is attached to the second door at a point similar to its attachment to the first. Enough slack is left in the chain to allow either door to be fully opened when the other is closed.



TWO DOORS CLOSED BY A WEIGHT ON A ROPE OR CHAIN

At a suitable point between the first door and the post, a weight is attached to the chain or rope. This is sufficiently heavy to pull both doors tight shut under ordinary circumstances.

The doors in question are near the fan at the top of the shaft on the return airway, which also serves as a manway. This arrangement prevents any careless person from short-circuiting the air, as only one door can be fully opened at a time.

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Producing Inert Gas to Prevent Explosions

John Harger in his book on "Coal and the Prevention of Explosions and Fires in Mines," gives the following methods of producing the mixture of carbon dioxide and nitrogen whereby he proposes to make the mines free from explosions.

"An atmosphere with an abnormally low percentage of oxygen is readily produced by mixing ordinary air with the calculated amount of nitrogen and carbon dioxide, which mixture is easily obtained by the combustion of suitable fuel, but great care must be taken that it contains no carbon monoxide. The exhaust from a gas engine, with its exhaust apparatus suitably modified, will give excellent results, if the air supply is controlled and complete combustion attained. This can be assured by leading the hot gases over a catalytic surface.

"Using a 25-hp. gas engine, the exhaust gas was found to be so hot (1100° F.), that complete combustion was readily effected without the use of a strong catalyst. All that was necessary was to pass the hot gases, as they left the cylinder, over ordinary broken firebrick, which offers plenty of surface.

"But in many cases it would not be convenient to use such a source, and the products of combustion from a gas-fired or coal-dust-fired boiler would be preferred. The exhaust gases from these would certainly not be so hot as 1100° F., but, by the equilibriating device described below, complete combustion can be induced, without any excess of oxygen, carbon monoxide or other unburnt material being left in the gas. This device can also be used with the gases from an ordinary Lancashire boiler,* the gas being passed through the apparatus before the economizer is reached.

"The equilibriating apparatus (called an equilibriator) consists of an iron vessel divided into two parts; the front part is packed with ½x1-in. pieces of special bricks made of a mixture of clay and titaniferous bog-iron ore, or any other suitable catalyst, while the second part is packed with granulated copper or scrap copper wire. The bog-iron ore bricks have the property of causing combustible gas and oxygen to react at low temperatures, and by this means the last traces of gas are oxidized to carbon dioxide and water.

"Any carbon monoxide remaining is removed by the copper oxide, while if there is an excess of oxygen it is removed by the copper. To oxidize some of the copper a slight excess of air is introduced when the apparatus is started, but in normal working, when sufficient copper oxide has been once formed, only the exact amount of air required for complete combustion is allowed to enter."

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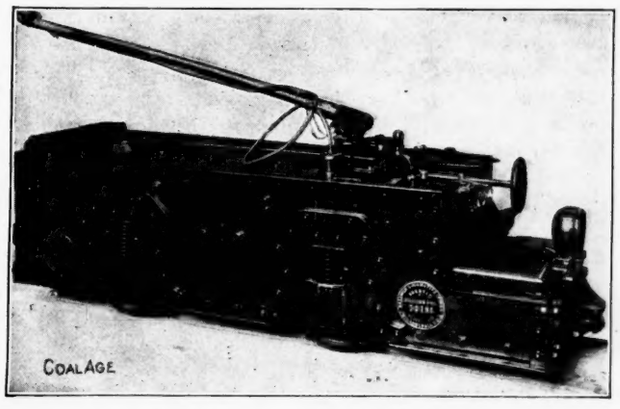
An American Mine Locomotive in Japan

The accompanying illustration shows the construction of a Baldwin-Westinghouse electric mine locomotive at the mine of the Ishikari Coal Co. in Japan. This machine was designed for a track gage of 1 ft. 8 in., measures 8 ft. 9 in. in length, has a wheel base of 3 ft. 6 in., stands 3 ft. ½ in. above the track, has a total width of 2 ft. 11⅝ in. and weighs 6000 pounds.



GENERAL VIEW OF LOCOMOTIVE

The frame of this locomotive is of plate steel. The drivers are 20 in. in diameter and are actuated by two motors hung inside the frame and wound for 500 volts. The machine is provided with sanders for all four of the wheels and two electric headlights. It is well designed, compact and well protected from dirt and dust.

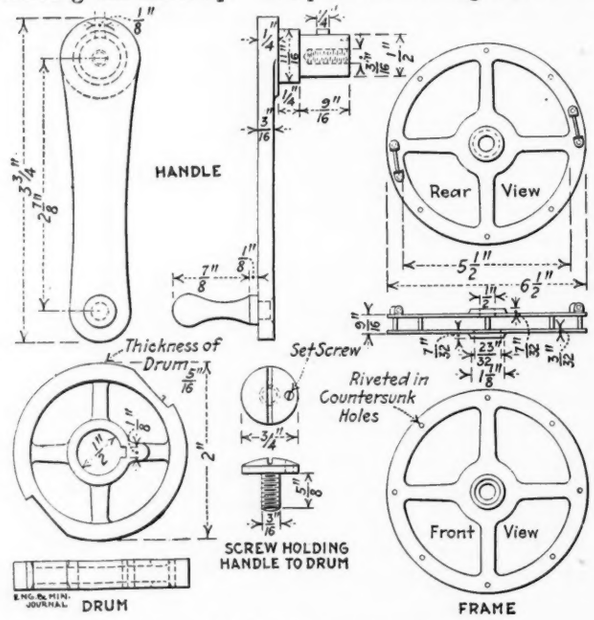
*A boiler with two large flues passing horizontally from front to back end. In these, combustion takes place. Probably any other boiler would serve as well.—Editor.

Reel for Underground Tape

By Charles H. Scheuer*

Experience with several varieties of tape reels in underground work led finally to the adoption of the Purdue model, manufactured by the Keuffel & Esser Co. It was found that considerable annoyance was experienced from the loosening of the screws, several of which entered into its construction.

To remedy this, certain improvements were described to the manufacturers and the reel shown in the detailed drawing was made up. The particular changes are: An



Reel for 100-Ft. Underground Tape

enlargement of the diameter so as to accommodate a muddy tape; the substitution of countersunk rivets for screws through the spreader washers between the two sections of the frame; the use of a countersunk riveted knob for the handle knob instead of a swiveled and screwed ring; and the fastening of the handle into the drum by a flat-headed screw, itself fastened by a setscrew. The result is a rigid and durable reel which can be taken apart as far as necessary by loosening the setscrew, removing the flat-headed screw and so releasing the handle from the drum. For a 200-ft. tape, the diameter should be increased to 7½ in. in the clear.

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The Burning of Coal at Outcrops

The "Report on the Coal of Grand Mesa and West Elk Mountains, Colorado," published by the U. S. Geological Survey states that:

"The coals of Grand Mesa are burned along the outcrop in many places. Indeed where the rocks are well exposed, it is difficult to find coal at the surface. In place of it the rocks are reddened by the heat from the burning coal, and in some places they have been melted and form 'clinker.' Where the coal is protected at the outcrop by a covering of soil or slide rock, it has taken fire in fewer places.

"In the Palisades and Rollins districts, where the coals are low-grade sub-bituminous, the burning in the exposed slopes has been general. Farther east, where the coals have been hardened by the metamorphic influences of the igneous mountains, burned areas are rarely found. Because of their exposure to the hot sun, the southward-facing slopes about Grand Mesa become dry and do not support enough vegetation to hold the soil in place. The rocks consequently have become exposed, and the coal is generally burned along the outcrop.

"The northward-facing slopes are not parched so quickly by the sun and are more completely clothed with brush, the roots of which hold the soil, and this in turn protects the underlying rocks. On these slopes the coal has not been burned so generally as it has been on the southward-facing slopes.

"The belief is general that the fires were started by the spontaneous ignition of the coal. There seems to be proof that fires have been started in some coal fields in this way, and there is good evidence that some mines have taken fire in the same manner, but apparently the theory of spontaneous ignition of the coal has been too generally accepted.

"Careful observations were made in this field for evidence bearing on this question, and although coal was found in all stages of weathering, ranging from freshly exposed faces to beds of slacked coal that must have been exposed for many years, not a single place was found where the coal at a natural exposure showed any indication of heating.

"It is a well known fact that dampness favors spontaneous ignition, yet in the Grand Mesa field the coal in the southward-facing slopes, which are dry, is burned much more generally than that in the damp slopes which face northwards. The coals of the dry, exposed sidehills would be ignited by forest fires much more readily than those of the damp, soil-protected slopes, and in the writer's opinion the burning of the coal in Grand Mesa is more due to forest fires than to spontaneous ignition.

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Summer Meeting of Rocky Mountain Coal Mining Institute

At a meeting of the Executive Board, held in Denver on Apr. 15, it was decided to hold the next meeting of the Rocky Mountain Coal Mining Institute in Salt Lake City. A special train, consisting of a baggage coach, dining car and Pullmans, will leave Denver at 9 p.m., June 9, arriving at Rock Springs the following morning, where the day will be spent in viewing the most important properties in this location, arriving in Salt Lake City early on the morning of the eleventh..

The Institute will convene at 10 o'clock on the morning of June 11 and hold a session for the balance of the morning. The afternoon will be devoted to a trip to the Bingham copper properties, probably the most interesting in the world. The morning of the twelfth will be devoted to Institute business, reading of papers, etc., and in the afternoon a visit to Salt Air will be made, where the rest of the day will be spent. The thirteenth will be devoted to any Institute business which may remain incomplete, to auto rides about Salt Lake City, and to a grand concert in the Tabernacle.

Note—From the "Engineering and Mining Journal," Apr. 26.

*Chief engineer, Fayal district, Oliver Iron Mining Co., Eveleth, Minn.

As at present arranged, the party will leave Salt Lake City on the return journey, by way of the Denver & Rio Grande R.R., some time during the night of the thirteenth, and will stop over at one or more important coal properties on the way back. It is proposed also to spend three or four hours in Glenwood Springs, to give the members an opportunity to indulge in bathing in one of the finest pools in the West. From this point there will be a daylight ride through the Grand River Cañon and the Grand Cañon of the Eagle River, so that the beauties of this wonderful portion of the state may be seen by those who have not yet had the opportunity of traveling over the line in daylight.

The railroad fares for the round trip will be as follows: From Trinidad, $26.15; from Walsenburg, $24.75; from Florence and Cañon City, $24.50; from Pueblo, Colorado Springs and Denver, $22.50. The Pullman charge for the entire time will be $9.10.

Please remember that the special train will be made up in Denver and will not leave until No. 3 of the Colorado & Southern arrives. Any member living in Wyoming may make arrangements to join the party when the train reaches his station.

Members returning may alight from the special train at Pueblo, Cañon City, or any point most convenient for making connections with their homes.

Several interesting papers will be presented at the convention and a good time is promised to all.

The Institute will furnish an official badge for all members and friends in attendance, and each person is urged to bring his family or any friends who he thinks would be interested in making the trip or in the proceedings of the convention.

In order that the Institute officers may make arrangements for the train, it is urgent that each member signify immediately whether or not he will be able to become one of the party. Let everyone make arrangements to attend.

E. H. WEITZEL,
President.

F. W. WHITESIDE,
Secretary.

Miners Plan to Organize a W. Va. Field

SYNOPSIS—At a meeting of delegates in Charleston it was decided to organize a new district of the United Mine Workers of America. This will include the New River, Gauley and Winding Gulf coal fields in West Virginia.

One hundred and seventy-five members of the United Mine Workers of America, representing practically the whole of the New River, Gauley and Winding Gulf coal fields of West Virginia met in convention in Charleston, on May 10, for the purpose of forming a new district of the miners' organization.

As originally intended, the meeting was to be in the nature of a conference between the delegates and the operators. There was, however, no response when the chair asked for expressions from operators present. Vice-President Hayes then informed the delegates that, in carrying out the promise of coöperation from the national organization, the International Board had decided to form a new district in West Virginia.

The morning session, on Saturday, was addressed, in turn, by National Vice-President, Frank J. Hayes, who called the meeting to order, by District President Thomas Cairnes and International Board Member Thomas Haggerty, who had just returned from the International Board meeting at Indianapolis. National President John P. White also spoke for over an hour.

The afternoon session was addressed by Senator Wm. Green, of Ohio, who is a member of the United Mine Workers, and the International statistician of the organization, and, finally, the convention listened to an address by Governor Hatfield.

President White, in his talk, viewed the history of the organization and set forth its ideals. He spoke at length of what is expected of the future in West Virginia and pledged himself to do all in his power to assist in the work which has been so well begun.

Senator Green's address was one in which great emphasis was placed upon the benefits of organization, and, incidentally, upon the struggles that precede every achievement tending toward the welfare of humanity.

Governor Hatfield paid a fitting tribute to the men who toil—in mine, mill and shop. He wished the delegates a pleasant day in the city and assured them, unequivocally, that they had nothing to fear from him as governor of the state. "I exact but one thing," he said, "and that is respect for the law. The miners stand as high in my estimation as the mine owner. Show me and I will be your protector."

He referred, briefly, to the settlement of the Paint Creek and Cabin Creek strikes and of his part in bringing about their settlement.

"I do not question your right to organize," he said, "the physicians, lawyers and the mine owners organize, and why should I question your right to the same privilege. I am your governor, and I prefer to be the laboring man's governor to any other man's governor, and all that I ask of you, as your governor, is regard for the legislative enactments of this state and due respect to your God. Do not regard me as an oppressor. Demand your rights as men but do it in a legitimate way, and you will have me as your governor, to protect you in securing those rights.

"Do not take the law into your own hands. If you suffer from the oppressions of a stronger hand, appeal to the law. I know it has been said that the law is controlled by a certain class; but before God I tell you the interests do not control me.

"Go about your work deliberately, lawfully, manfully. Demand your rights and you will achieve the victory. About the guard system, there is no necessity for guards in West Virginia or in any other state. The mine guard law is about to go into effect, and I promise you that I will see that the statute is absolutely and strictly adhered to and enforced.

"In conclusion, go about your deliberations like men. Do not put yourselves in the position of lawbreakers. Do the right. And, if a strike is necessary, and you act like men, you will have my protection."

An Effective Slate Picker

The accompanying photograph shows a Mason & Allen flat slate picker in operation in a washery of the Hudson Coal Co. handling material containing 20 to 32 per cent. flat slate and throwing out 18 to 21 per cent. in the process. Tests of the droppings have never exceeded 3 per cent. coal and have been as low as 1 per cent.

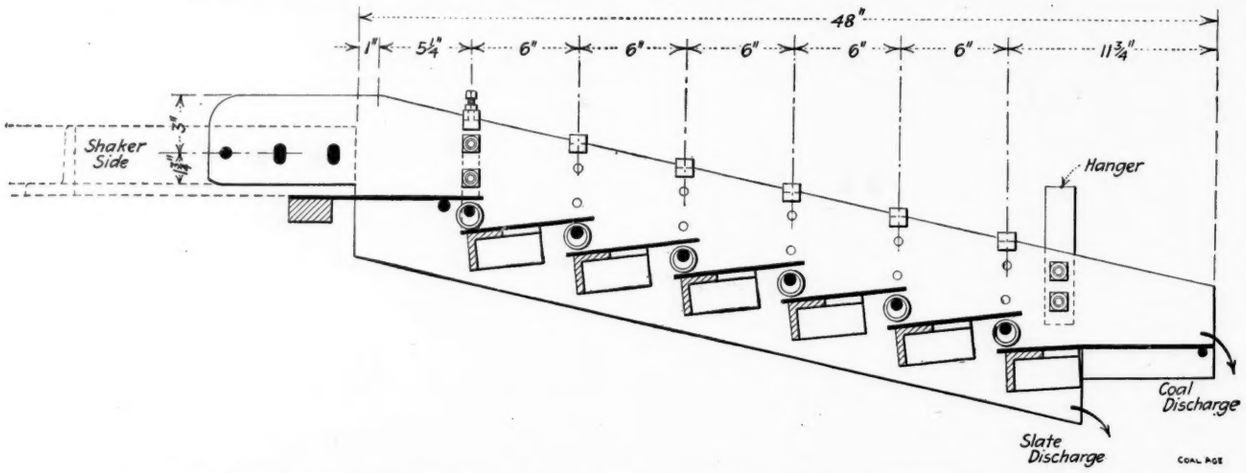
The D. L. & W. R.R. is using these pickers on chestnut, pea and buckwheat coal. The machine is so constructed as to be attached readily to any standard coal shaker by means of bolts and suspension rods and is designed to separate flat slate and rock from the coal, as it passes from the shaker.

This is accomplished by a series of horizontal plates rigidly fastened in a transverse position between the side plates in step fashion, so arranged as to permit a swinging cylinder, eccentrically pivoted to the side plates by means of adjustable boxes, to hang parallel with and under the front edge of each plate with an opening or space between the bottom of the cylinder and the plate below it.

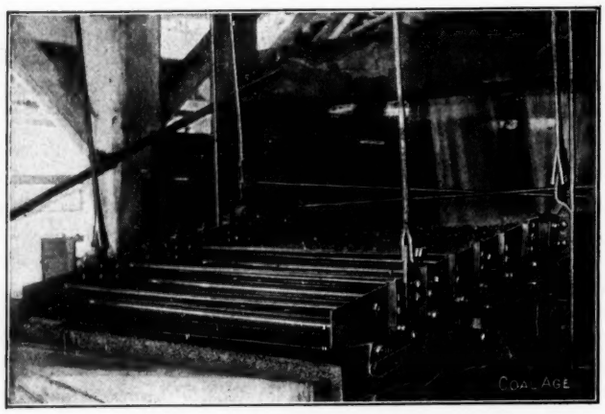
This arrangement allows the flat slate and rock to pass back through the opening while the coal passes on over the plates to the chute. The cylinders swing automatically with the movement of the shaker and are controlled in the swinging movement by weighting.

The action of the machine is quick and effective, making the limit to its capacity difficult to estimate.

The simplicity of this device appeals to all coal experts. It is built to stand the severest usage, and is provided with adjustments to meet all conditions.



CROSS-SECTION OF PICKER, SHOWING SHELVES OR STEPS AND THE ECCENTRIC OR SWINGING CYLINDERS



THE PICKER AT WORK

Rules of Thumb for Metric Conversion

Certain approximate relations between common metric units of measurement and their English equivalents exist. Albert A. Cary presents these in *Power*, Feb. 18, 1913, in the form of the following handy table:

Dimensions etc.	Unit Used	Converted to	Rule
Weight	Kilogram	Pounds	Multiply by 2 then add 10 per cent.
Length	Meter	Feet	Add 10 per cent. then multiply by 3
Surface	Square meter	Square feet	Add two 10 per cents, then multiply by 9
Volume	Cubic meter	Cubic feet	Add three 10 per cents, then multiply by 27
Capacity	Liter	Quarts	Add one-half of 10 per cent. (or 5 per cent.)
Temperature	Centigrade	Fahrenheit	Multiply by 2; subtract 10 per cent., then add 32
Heat	Calories per kilogram	B.t.u. per pound	Multiply by 2, then subtract 10 per cent.
Heat	B.t.u per pound	Calories per kilogram	Multiply by 0.556 (or divide by 6 and then by 3)
Pressure	Kilograms per square centimeter	Pounds per square inch	Multiply by 14.223 or divide by 0.07
Pressure	Pounds per square inch	Kilograms per square centimeter	Multiply by 0.07
Evaporation	Kilograms per square meter	Pounds per square foot	Divide by 5
Evaporation	Pounds per square foot	Kilograms per square meter	Multiply by 5
Distance	Kilometers	Miles	Multiply by 0.6 and add 5 per cent. of the product
Distance	Miles	Kilometers	Multiply by 1.6
Capacity	Cubic centimeters	Cubic inches	Divide by 16 (or by 4 twice)
Capacity	Cubic inches	Cubic centimeters	Multiply by 16

The rules are so simple as to be easily carried in the head, but for accurate results more complicated factors must be employed.

Substation Loads in Lackawanna Collieries

On page 713, issue of May 10, the table of Connected-Load Factor at Substations, states that the per cent. for the largest station is 32 and the per cent. for the average station is 29. These figures should be reversed. The other figures, which all show an opposite tendency, are correct.

EDITORIALS

Gasoline-Locomotive Costs

The cost of operation of the gasoline mining locomotive varies considerably with the conditions under which the machine is called upon to operate. The price of fuel and supplies, the wages of the driver and brakeman, the condition of the track, the grades to be traversed and the loads handled, all have a direct influence upon the cost per ton-mile.

With these locomotives, as with other machinery, it is but natural to expect that the cost would decrease as the amount of work done increases, and that the best results would be obtained when the locomotive is operated up to its capacity all of the time. Recent experiments in Europe appear to substantiate this idea.

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The Geyser at Equality

The phenomenon at the Gallatin Coal Co.'s mine has occasioned general interest and it is differently termed by everyone according to his belief in what constituted the originating cause.

The author of the article we published last week accepts the more usual interpretation of the forcible ejection of water at Equality. The view is that taken by F. Rosbottom, the inspector of the district in which the mine is located and by several others. He regards the emission of water as resulting from the compression of the pent-up air. This action, however, would not have been violent. The air would have slowly pushed out the water, as soon as the surging flood had lost the velocity head with which it entered the mine.

If, however, a large and seemingly impossible body of air had escaped and filled the shaft for almost its full length, the downward weight of the shaft content would have been almost nil and the upward pressure would have been large. If there were another point of entry from the surface containing all water and no air, the pressure would be that of a body of water 80 ft. deep and this upward pressure would be exerted on what little water might be over the top of the shaft, which was full of air. Under those circumstances the water would have been lifted 80 ft. in the air if all resistance to its motion were removed.

Had the whole main entry and shaft become filled with escaping air, a still more unlikely supposition, the water might have belched out to a height of 120 ft. This gives the maximum elevation which the air-lift theory would permit us to expect.

The witnesses declare this elevation was exceeded. Whether their view is justified is questionable because there were few objects high enough by which momentarily to measure such extreme elevations in that flat country. The height of the second effluent column was probably estimated with more accuracy and the estimate was accordingly lower, namely, 260 ft., and even that hardly accords with the illustration we show.

Some have thought that an explosion took place, the water driving the air in old chambers on to a light left burning in some part of the mine. While the author of the article does not say whether gas is found in the workings, he does give a strong impression that the danger of flooding had caused the complete abandonment of the mine for such a length of time that there could not have been any light burning. The inspector says there was no mine fire in the workings. Hence there does not seem a leg on which this theory can stand, though unlikely solutions are permissible where there is so much uncertainty.

Another solution remains. The mine had never caved; the pressure of the water in the measures when the surface was submerged may have weakened the roof, causing it to fall later. Had the overburden to the grass roots descended slowly in the lowest part of the workings, the water might have been thrown up to a height of about 324 ft. If the roof fell where a certain amount of free fall was possible, the effect of its energy of descent would have been to make an even more violent effluence.

The mine is ruined and closed and it may be months before it is opened. Meantime the roof may fall and changes take place. The problem of the aqueous outburst may continue to be as mysterious as the violent projection of water from the West Kentucky Coal Co.'s shaft in the same section of the United States.

The Crescent, a small shipping mine, and the Sunnyside and Clover, which produce coal for local consumption were also flooded but were otherwise undamaged. No such geyser-like ejections, however, took place at these mines

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Appointment Not Confirmed

The recent appointment of John Mitchell, former president of the United Mine Workers of America, by Governor Sulzer, to be the head of the state Department of Labor, in New York, marks the earnest desire of the governor to reorganize this department. A better man for the position could not have been selected than John Mitchell, who is universally conceded to be better qualified to fill this important office than any other person in the country. The fact that Mr. Mitchell has only recently removed his residence to New York State forms no adequate excuse for the rejection of his appointment by the Senate.

When that body refused to confirm the appointment of Governor Sulzer, in this instance, it placed itself in a position to antagonize the strong labor vote of the state. Mr. Mitchell has few enemies and many friends, not only among the labor classes, but among the large majority of thoughtful people, regardless of politics.

Governor Sulzer's appointment, in this case, met the general approval of the people of the state, who are well pleased with his determination not to abandon the hope of having the appointment of Mr. Mitchell eventually confirmed, at a special session of the legislature to be called June 18.

To say that we heartily indorse the appointment of John Mitchell as the head of the Department of Labor, in

New York State, would be to express mildly our appreciation of the work done by this man. Perhaps no one has ever handled more successfully than Mr. Mitchell the aggravated conditions that have existed, from time to time, between the mine workers and mine operators. No one has won so high a degree of the confidence and esteem of all classes, as this advocate of equal rights and justice.

Whatever mistake Mr. Mitchell may have made that led to the disregard, by the organization of which he was president, of a judicial mandate, it is still a matter of deep regret that recently the Court of Appeals of the District of Columbia has refused to reverse the decision of the lower court, by which Mr. Mitchell was declared in contempt. A further appeal to the United States Supreme Court is contemplated; and, although, from the nature of the case, little hope can be entertained as to the result, it can hardly be expected but that final sentence will be suspended. By this means, not only would the majesty of the law be upheld, but due respect would be paid to one whose tireless efforts have always been at the service of his fellow workers.

The Miners' Union

Unions seem necessary evils like armies, for the workman needs to defend himself as much as the nation. But against whom is his defense mostly directed?

Ostensibly every strike is a quarrel between employer and employee. Practically it is a battle between workingmen. Other operatives having received an increase in wage, the miner finds everything which he has to buy increased in price. So he strikes to make his employer charge those operatives an increased price for coal. It is a continuous struggle for life and comforts between man and man. The operator is only the go-between, the much berated middleman.

The necessity for the union might be removed if the operator would adopt a sliding scale, based on the right of the laboring man to buy so much of the other man's labor for so much of his own. Let the operators and miners form a bureau of experts to ascertain the articles purchased by miners and the amount of each type of purchase. Then let the board ascertain as nearly as possible the labor involved in the production of such articles under present-day methods of manufacture. The result would show how many hours of other men's labor were equivalent to the year's work of the miner.

This figure should be kept constant year by year, the miner's power of purchase increasing with the increased output due to improved methods of operation. The result might not be exact. There are some factors too hard to weigh with precision, but any solution seems preferable to annual or at least frequent strikes which, like wars, destroy more than they create.

The method of calculation advocated is at least as scientific as the method of hunger-strike and violence, which is a purely arbitrary attempt to adjust matters. Though our courts are not perfect, no one suggests a return to the trial by ordeal and though a bureau might be wrong in some of its conclusions, the labor struggle is still more unscientific and does not recognize the point at issue.

In fact, the strike often terminates in the defeat of one party because in the past that party has been most unjustly treated, because the laboring man has been deprived of the power of saving, or the operator prevented from securing a bank account.

It is time that it was clearly understood that any rise in wage of one class of employees must be taken out of the pockets of other operatives. There can be no federation of labor; there can only be a truce between workingmen, an arbitration of the wage war between them and the plenitude which results from the blessings of industrial peace.

Crazy Legislation

That an undue and unwise influence is being exerted by the prime movers in the United Mine Workers Organization to control legislation in Pennsylvania and force the passage of certain bills at the present session of the legislature, has been evidenced in a number of instances, by the acts of the Lower House. In no case, however, has this been made more clear than by the passage, Apr. 29, of the bill, House File, No. 1219, presented by Mr. Lenker, of Dauphin County.

The bill is an act to amend Section 7, of the act approved May 3, 1909. By this bill, which has just passed the House, the number of mine inspectors in the anthracite region of the state would be increased from 21 to 31, or nearly 50 per cent., and represent an increase of $30,000 in the annual cost of inspection of these mines. There is no question but that the number of inspectors should be increased in that district. The Anthracite Code Commission in their report recommended an increase of four inspectors for the anthracite mines, which, in their judgment, would be sufficient to meet the present needs.

It will be remembered that only recently the House passed the Schaeffer bill by a vote of 157 to 0. This bill emanates from the same source—the Mine Workers Organization—and makes all holders of mine-foreman certificates eligible to candidacy for the position of mine inspector, without further examination. The Mine Workers made an unsuccessful attempt to have this provision adopted by the Mine Code Commission, and are now endeavoring to force its passage in the legislature. It is amazing that Pennsylvania legislators would lend an attentive ear to these appeals, coming as they do from an unauthoritative source, while the recommendations of the regularly authorized Code Commission are allowed to languish.

Fires at Coal Outcrops

We quote today a statement of the Geological Survey relative to the crop fires in the Grand Mesa. The Survey follows the popular idea that water normally aids coal to burn. There is little probability that coal containing all the moisture natural to it is likely to be caused to burn spontaneously by the addition of water. The heat of hydration cannot take place without previous dessication.

On those faces of the hills where the coal is likely to be deprived of much of its natural moisture, we would naturally expect the coal to fire on being wetted if hydration is ever sufficient to account for the ignition of coal. It is in such dry and exposed places that the Survey has found the most frequent ignition and while it may be reasonably ascribed to forest fires, the cause may be due to hydration of the dried coal, despite the reasoning of the monographer.

SOCIOLOGICAL DEPARTMENT

The First-Aid Muddle

By a Physician

SYNOPSIS—The author believes that first aid should be standardized. Variation of methods confuses and disgusts the trained men. The advisory board of the American Mine Safety Association is not well chosen and the schedule of discounts recommended at last year's conference is amusing but worthless.

To anyone who has had much experience in first-aid work in this country, it is quite evident that something is radically wrong with the system of instruction. In studying the reports of the work already accomplished, the investigator discovers a deplorable condition of affairs, though the first glance seems to show that rapid strides are being made in the education of the men employed in hazardous occupations.

The inquirer finds that first aid is being taught in the United States by many different organizations, chief among which are the American National Red Cross, the Bureau of Mines, the Young Men's Christian Association, the many separate first-aid organizations and the various companies which have instituted the work independently. These bodies are not working in harmony. Their instructors are teaching different methods of treatment and are recommending the use of different appliances. From a purely local viewpoint, this may not seem important. To those of us who hope soon to have as efficient a first-aid organization in this country as the St. John's Ambulance Corps is in England, it is a cause of much alarm.

Variation in Training Methods

Those present at the National Mine Safety and First-Aid Exhibition, at Pittsburgh, in the summer of 1911, were struck by the many different methods by which the same injuries were treated. Teams from different companies used wholly unlike methods in dealing with their problems. This had a bad effect upon the members of the various corps. They had come to the meet representing all the teams in their section and believing that they had been trained in the best methods. They found that there were many ways of treating the same injuries and there was no way for them to discover which were best. Returning home, they reported their discovery to the other teams in that locality and each organization demanded that their instructor teach them the best methods.

Their physician found in turn that there was no way in which he could discover the best treatments and to retain the respect of his class, he was forced to teach several methods of treating the same injury. This, of course, resulted in making still more difficult a subject already too complicated for the untrained mind. As a result, many organizations disbanded and countless men discontinued the work because it was too hard. This is wrong. First aid can be made more simple and must be so rendered before we can hope to derive the benefits which it offers.

That there should be a uniform system taught is evident. What that system should be is not so clear. While it is true that there is one best way of dealing with any injury, the fact is that no one absolutely knows what that best way is. Many men think they know but they can have no legitimate assurance.

The Defects of the Conference on First Aid

Recognizing this condition, the U. S. Bureau of Mines called a conference on first aid to meet in Pittsburgh, Penn., on Sept. 25, 1912, for the purpose of standardizing the subject. The report of this conference was eagerly awaited, as it was hoped that some questions of moment would be decided. When the report was received, it was found to be merely an expression of opinion of a body of men, few of whom were known. No experiments had been performed, no opinions of men eminent in the medical profession had been secured but a lot of resolutions had been passed for our guidance, for none of which any reasons were given.

At this conference the American Mine Safety Association was formed and the recommendations that an Advisory Board be appointed to have the power to accept or reject any dressings that may be offered, was adopted. This board is to consist of two first-aid men, two operators, two physicians and a representative of the Bureau of Mines. Why operators and engineers should have a place on a board whose proceedings to be of any value must be surgically scientific, was not explained. We are sure that no surgeon would desire a place on a board, the work of which was purely engineering in character.

Some Strange Decisions

A glance at the report of this meeting will show why it has been and will be totally disregarded. The recommendation that the Sylvester method of artificial respiration be adopted was followed in a few weeks by a report of a commission of scientists of national reputation, in which the Schaeffer method was declared to be the best. As this report was substantiated by the records of many experiments, it must be believed.

The schedule of discounts, presented by the conference and intended to apply to all contests, is amusing but worthless. In it contestants are penalized ten points for failure to be aseptic in the treatment of a wound, probably already infected, when the results of such failure, in the average case, would but slightly inconvenience the patient. The team is penalized but two points for failure to perform artificial respiration properly, when upon the correct administration of this, the patient's life absolutely depends. The fact that a contestant is penalized the same two points for lack of neatness and for tying a "granny knot" adds to the humor, but not to the value, of the report.

The American Mine Safety Association announces in its circulars that in the future it "will fix the standards in rendering first-aid-to-the-injured and set the standards for the construction and use of devices and appliances

for first-aid work." Before it can do this, it must show itself to be worthy of the honor. Such proceedings as are on record from its first meeting certainly do not prove that it should be accorded so much authority.

The Need for an Authoritative Council

First aid must be standardized by a board of men of national reputation; conservative, scientific men who will prove which methods are best and recommend only the methods thus proven. These methods, supported by the records of experiments and the testimony of eminent surgeons, will be received with respect by the medical profession and will be taught as the best by them. In this way, the first-aid movement will gain the respect of the medical men, upon whom its success absolutely depends, and the methods thus proven will be taught as best by all men.

Following such standardization, let a committee of first-aid men so grade the work that all classes will be taught by the same system. The first course should consist of the best methods; in the following courses the best of the alternate methods may be taught. Let all the organizations now teaching first aid coöperate so that no effort may be wasted and no ground covered twice. Then and only then can we hope to see first aid take its rightful place and expect to reap the full benefits of the system.

Pollution of Water by Mines

By a Pennsylvania Engineer

Among the new troubles of the operators and engineers of coal mines is to find streams in which to discharge the water from the mines without injury to the public. It is generally believed that the mines and coke plants injure farms to a certain extent and kill the fish. Where the waters formerly were clear as crystal, they are now yellowish brown with iron hydrate and made acid by the hydric sulphate formed in the mines.

Vegetation is killed by the dense smoke coming from the ovens, and as a whole the villages near coke works are not a desirable place in which to live. But these mines and coke plants are as necessary to the country as a boiler to a battleship. When these industries are closed down, the country cannot thrive. They are, themselves, the occasion and support of the very people and industries which object to their presence.

Pollution of Streams Illegal

A decision has been handed down in the Westmoreland courts forbidding coal-mining companies from polluting domestic water supplies by draining their "sulphur" water therein. James McCune contended that the Pittsburgh & Baltimore Coal Co. by draining the sulphur water from its mines into a stream of water, passing through his farm, which, prior to 1908 had been pure and suitable for agricultural purposes, had made the water of the stream unfit for use. Judge Doty decided against the coal company, and in doing so said: "It is clear that the defendant has no right to pollute the stream which flows through the plaintiff's farm; and being without right in the matter, the company must cease within a reasonable time to discharge the water of its mine into the said stream." Six months was suggested as a reasonable time.

The fact that the coal company owned the coal underneath the McCune farm did not, in the opinion of the court, give it any right to pollute the water supply of the surface owners. It is clear that the company must, at great expense, pipe this water through such farms.

An Injunction Granted, Forbidding Pollution

Several weeks ago the operators who desired to open mines along Indian Creek were stopped from further development by the Pennsylvania R.R., an injunction to prevent the pollution of the streams being obtained.

The Pennsylvania railroad corporation, through its subsidiary, the Mountain Water Supply Co., secured an injunction to prevent the pollution of Indian Creek in the Monongahela watershed. This stream is the source of the water used in filling the tanks of the locomotives in that section.

Some years ago the railroad company, finding that it could not get clear water to supply its engines in Pittsburgh territory, purchased rights along the Indian Creek valley and constructed a large dam. Over $15,000,000 was expended in providing for a pure-water supply, and the water was piped to the Union station in Pittsburgh and to other points in that section.

Indian Creek is now and was at that time the largest unpolluted stream in western Pennsylvania, as the coal mines and mills on the banks of nearly all the other streams had destroyed their purity by discharging large bodies of polluted water into them. Consequently the fish were destroyed and in the large streams they are almost if not quite extinct.

Along Indian Creek there are about 75,000 acres of undeveloped coal lands. The moneyed interests controlling these lands had been making tentative plans for the opening of this potential source of fuel. News of this reached the railroad company, and, as a matter of self-protection, steps were taken to preserve the purity of the streams, for if they were polluted by the coal mines, the huge investment made by the company would become worthless.

A Model Coal Town

Contractors broke ground yesterday for a model village which is to be built for the Pennsylvania Coal Co., around the Underwood shaft now being sunk on the hills east of Throop. The village is to consist of 28 double frame houses which will be of unusually strong construction so that they may be able to withstand the settling of the mine, as the coal is removed. The houses will measure 28x40 ft.; their sills or under frames will consist of single sticks of Georgia pine 6 in. square. These will extend the full length and breadth of the houses. Several frame dwellings are also to be erected for the colliery foremen and their families.

The model village is to be plotted out in wide streets with roomy garden plots for all the houses. It will have a central plaza and part of its equipment will be two public concrete bathhouses, one for men and the other for women. Hower & Stender, contractors of Scranton, are in charge of the construction work.

The Underwood colliery is to be one of the most modern in the anthracite region. It will open up big tracts of hitherto untouched coal and will give employment to a large population for many years. It is expected that the colliery will be ready for operation in a few months.

DISCUSSION BY READERS

Education in Coal Mining

Letter No. 15—In my opinion, the use of textbooks at examinations would be a backward step. The examination of mine officials has reached a high degree of perfection in most cases where this system has been adopted. I have no desire to detract in any way from the glory of the old-time practical mine foreman. I have the greatest respect for the man who has gotten his education from the point of the pick and the ring of the shovel. These practical, hard-working fellows are surely the best men in our mines; but the mining game, like all things else, is progressive and the uneducated man who was foreman or manager in the mines a generation ago will not answer now.

I attribute this change largely to the fact that our examinations are getting more difficult each year, and they are providing more alert and better educated men to fill the positions of foreman, assistant foreman and fireboss. To uphold this standard in examinations and to advance it, if possible, let us do nothing to make the examination easier. Give a fairly well educated man a textbook in examination on mining, today, and he will pass that examination with flying colors and, perhaps, never have seen the inside of a mine. For example, give a candidate the textbook, Examination Questions and Answers, for use in the examination, and it will supply him all the information he needs to pass this part of the examination. Then, if he can show that he has had the necessary experience and has the required knowledge of the mining law, there need be no fear but that he will pass the examination.

Some writers claim, in advocating the use of textbooks at examinations, that many of the formulas are complicated and hard to remember. I have passed the examination several times, in Pennsylvania, and each year it seems to me that the desire of the examiners is to get away from complicated formulas and advanced theories, as far as is compatible with securing men who can run a mine in a scientific and uptodate manner. Permit me to add that most of the men now managing our uptodate collieries are largely those who have passed the examination without books. They had to study and study hard to remember the laws, principles of ventilataion, haulage, methods of working, etc. The result is that a man who remembers such data keeps uptodate and is proud when the inspector who made him pass the examination without the books, visits his mine.

The examinations for mine foreman and fireboss certificates, in Pennsylvania, are reasonable and fair. All questions asked are questions that relate specifically to the regular work these men must do in and about the mine, or refer to such work as may have to be done at any time.

I cannot understand how it is expected to make an efficient mine foreman out of a man, who, when an unusual condition arises in the mine that demands immediate attention, must rush to his library to look up the needed information. I believe a man should have this knowledge at his fingers' ends and understand the principles of mining, so that he can give an intelligent answer to every question liable to occur in daily work, without consulting a library or textbook.

Although many men went to work in the mine when they should have been in about the fourth room at school, there is practically little excuse today for their not being able to pass a rigid examination, because of the numerous correspondence schools, night classes, libraries and other facilities for learning open to them. I do not wish to convey the impression that, in my opinion, the best educated men are the best mine officials, as I have known many such men to make failures as mine foremen.

Some time since, I was on a train approaching Washington. The train stopped at the yards, some miles out from the city, for a second engine, when a fellow passenger inquired why they did so. The reply was: "Well, I'll tell you; it takes a mighty good pull to get into Washington." Many of us have the same view with regard to securing a position of responsibility in the mine. They think that if they can get a "pull" somewhere, they can have any position they want. I am glad to say the time when that is possible is fast going by. Mining companies today realize that efficiency rather than favor is what they require, and we must regard it in the same manner. Lawyers, doctors and men of other professions, study constantly to improve their minds and keep uptodate, and mining men must do the same or be relegated to the scrap heap. Let us make every effort possible to elevate the standard of mining; let us get the textbooks into our minds instead of taking them into the examining room.

SAMUEL M. MCMAHON, Supt.
West Virginia-Pittsburgh Coal Co.
Wellsburg, W. Va.

Letter No. 16—The question of educating the miner is one that needs and should be given more than a passing thought. The nature of his occupation; the duties that are required of him; the responsibilities that rest upon him in his relations to his fellow workman; these are some of the things in which he should be educated. No man who works in the mines works to himself alone. The safety of other workers depends on his ability and knowledge, which fact requires that he should be well informed in respect to his duties to his fellow workers and to himself.

In my opinion, the one question of educating the miner has not been given the consideration and attention, in the previous letters, that it should have had. The writers have dwelt more upon the education of mine foremen and firebosses. It is of equal importance to consider the question of educating the miner in respect to his duties in mining coal. The miner, today, is not the same as the miner twenty years ago. At that time, the English-speaking miner was the most prominent, while

now the majority of our miners speak a foreign language and in a large measure are ignorant of many of the conditions that govern the mining of coal. They need to be educated in more ways than one.

Many miners, today, are unable to read or write their own names and cannot make up the time sheet that they are required to turn in to the colliery office. They cannot write a danger signal or the word "dump" on a car, if need be. It is important that all mine workers should have some knowledge of reading, writing and arithmetic.

While the efforts put forth to educate the foreign-speaking miner have met with a measure of success, a very small number of these men are being reached. Greater efforts should be made to make them more efficient in their work. They should be properly instructed in respect to the best and safest methods of mining coal and made more familiar with the nature of the explosives they use and the proper handling of the same. It is true that powder companies give rules for the use and handling of powder; but, as most of the miners cannot read the English or any other language, they cannot understand, except as they are told by some other person. They should be made to know what they are handling and how to handle it with safety to themselves and others. They should be properly instructed as to the nature of the roof and other conditions about them. They should be taught how to properly timber their place, and be made acquainted with certain conditions that present themselves, and told what to do when these conditions are known to exist.

The anthracite mine laws are made for the protection of life and limb; but probably 90 per cent. of the foreign-speaking men who work in the mines know nothing of what the law contains; and it is important that they should be made acquainted with the mine law. Again, accidents happen to many as a direct result of their ignorance of the safety appliances that are provided for their welfare; and also from their inability to properly understand the directions and warnings given to them by the foreman or his assistant.

But this education, to have proper effect, must not be given with a rod of iron or lash of the whip. Treat these men kindly; show them their duties in a brotherly spirit; let them feel that you are interested in their welfare and are doing this for their good and not for your personal benefit. If all coal companies would make an earnest effort to educate their employees they would get better results from their labors and thereby increase their earnings, and there would be less suffering and loss of time through accidents.

The reason the foreigners do not get hold of the English language sooner is that they live, work and keep among themselves all the time; they talk only their own language and are slow to learn and understand what is required of them in the mine. Educate the miner and you have solved one of the most perplexing questions in the coal fields of today.

EDWARD SANDERS.

Scranton, Penn.

Letter No. 17—I am not in favor of the use of textbooks at a mine-foreman's examination as, in my opinion, it would have a tendency to create mine foremen who are not practical mining men. I believe a man who has a college education but has never worked a day in the mine could, with the help of textbooks, solve certain kinds of questions given in the examination, especially if the proper formulas were furnished by the board; and yet if similar questions came up in actual practice in the mine, the same man would not be able to reach a practical solution because he would not have the hint how to proceed or anyone to suggest what formula he should use.

On the other hand, the practical mining man who has had a fair education and studied hard to keep up to the times should be able to pass the examination and get his certificate without the use of a textbook. In the end, such a man will make a more efficient mine foreman, as he would have a better idea of how to apply the correct formula in practice.

Examinations for mine foremen should be conducted along practical lines; that is to say, questions given and the conditions should be similar to those that are met every day in the mine. All men who are seeking certificates of proficiency that would make them eligible to the position of mine foreman or fireboss should be equipped to solve practical questions that call for good judgment in regard to safety, workmanship and economy. I do not think that they should be given the use of textbooks or formulas in examinations.

JOHN H. KELLY.

Seanor, Penn.

Two Useful Devices

I noticed a sketch for a safety block for inclines, in COAL AGE, of Mar. 29, p. 487, which was interesting, but I believe we have one in use at our mine No. 9 which is much more simple. It has been now employed for several years and has never failed. The angle of the incline to the tipple is 36 deg.

All that is necessary in making one of these stops is a piece of rail about 7 ft. 8 in. long, an old mine-car axle

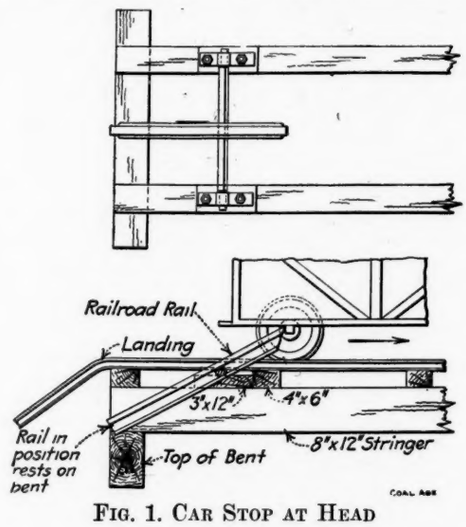


FIG. 1. CAR STOP AT HEAD

and two small clamps which any blacksmith can make. Add to this 4 long bolts to fit existing timbers and the list is complete.

I believe Fig. 1 is self-explanatory. We use the device shown, on the track for loaded cars. On the empty track we use a similar stop, but have a lever attached to the axle so that the block is lowered when cars are let down the slope. It is always best to have the lever so arranged

that the safety block is in position unless held forcibly down.

Fig. 2 is a sketch of a device for switch-backs from slopes where there is much liability to derailment. The sketch shows plan of tracks at bottom of shaft No. 8 of the Osage Coal & Mining Co.

The cast-iron plate at *A* was arranged so that no frog point would be necessary. The main rail *E* is laid exactly

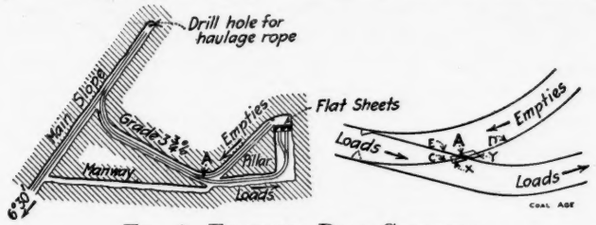


FIG. 2. FROGLESS RAIL CROSSING

flush with the part *Y* of the plate *A* and also with part *X* except that a groove is left for the wheel flanges to run in. The two rails *C* and *D* are laid just the height of the wheel flange above the plate *A*. Rail *D* is laid so that the outer rim of a passing wheel will just clear.

GEORGE M. BROWN, Engr.,
The Great Western Coal & Coke Co.
McAlister, Okla.

A Geyser from an Anthracite Mine

In the issue of May 3, page 693, you speak of the geyser-like action of the water in a flooded mine. During the recent high water in the Wyoming Valley, when the river broke into the old workings of the Enterprise Colliery, old railroad cars and baled hay were thrown in to try to fill up the opening, and when the water was forced out, evidently in the same manner as in the mine referred to, the hay was thrown high into the air. As the foreman in charge of the work expressed it: "It swallowed everything until we began to feed it baled hay, and then it threw up."

E. C. LEE.

West Pittston, Penn.

Loss of Life in Coal and Metal Mines

Referring to the article on the meeting of the Institute of Mining Engineers, May 2, line 7, top of page 730, should read 282 days instead of 300 days, that being the average time worked at all mines other than coal mines. In the accompanying table below the correct figure, 282 days is given.

Referring to the financial loss due to accidents, the totals are correct. The time loss resulting from serious accidents only is calculated on a 30-day basis at $3 per day for metal miners alone.

You do not state, however, that coal miners and quarrymen are figured on a basis of only $2 per day. The loss due to slight injuries is based not on 30, but on 5 days off duty with wages as above stated.

Taking the serious and slight injuries for the quarry and mining industry as a whole; their relative ratio is approximately 14 to 49; in other words, the slight injuries amount to about 3½ times the serious injuries as actually reported.

A. H. FAY.

Bureau of Mines, Washington, D. C.

Drawing Post Timbers

I was interested in reading the article on the Recovery of Mine Timber, by J. W. Powell, COAL AGE, Apr. 5, p. 529. I have seen a great many posts drawn with the Sylvester machine, and consider this the best way to recover timber from worked-out places. I want to make one suggestion:

It is dangerous to anchor the machine to a post, unless that post is properly set for the purpose. Mr. Powell mentions this as a precaution that should always be taken when drawing timber, but does not state how such a post should be set. It is important to set the post leaning toward the one that is to be drawn, as I have indicated in the sketch, Fig. 1. The anchor chain is fastened near the foot of this post, and the pull on the chain only tightens the post. This anchor post is moved back as the work progresses. I have often seen men spend much time in attempting to draw a post, without a machine and finally lose it under a heavy fall. A machine would have saved much time, and the post would not have been lost.

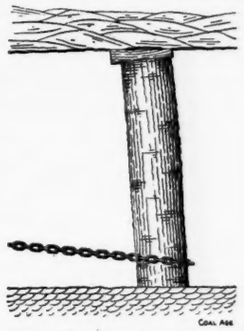


FIG. 1. ANCHOR POST SET FOR DRAWING TIMBERS

Referring to the article, Waste of Mine Timber, COAL AGE, Apr. 26, p. 653, the form of timbering described where a single stringer is used in the roof and the side struts or rafters are made to bear against this stringer is what we used to call the "herring-bone" system of timbering. It is a good system to use in certain roofs and is shown in Fig. 2, which is a cross-section of the entry.

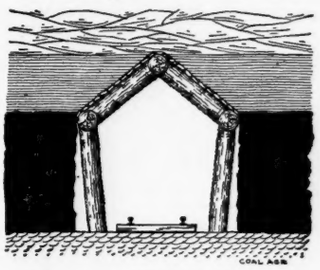


FIG. 2. A HERRING-BONE TIMBER SET

CHARLES WAINE.

Marianna, Penn.

Removing Powder Smoke from Mines

Some time ago the question of reducing ventilation at the time of firing was discussed in COAL AGE. Many of those who took part in the discussion seemed to think that to reduce the ventilation at firing time, will minimize the dangers of an explosion. The only reason given by the advocates of this practice worthy of any consideration was that the supply of oxygen being reduced combustion would cease. I consider such a theory practically impossible in mines where men must work. These advocates argue that there are more explosions in new and undeveloped mines having an abundance of air, than in old and more extensively worked mines where ventilation is not good. They point to the fact that the intake air current, in a mine, is more subject to explosion than the return; and that there is more danger of explosion in the winter than in the summer time; and they attribute these facts to the greater supply of oxygen.

While I do not wish to be understood as believing there is nothing in the arguments advanced; I must contend, nevertheless, that any results obtained by reducing the ventilation at firing time cannot be attributed to the lack of the supply of oxygen. In order to make myself clearly understood, permit me to relate the following experience of my own: Assuming the management of a new and undeveloped mine, May 1, 1910, I double-shifted all the work; and, to give the men every advantage possible, I permitted the firing of shots at midshift.

Two shafts had been sunk but were not connected below, and the only means of ventilation was through an air compartment made by carrying a brattice down the shaft. A steam jet, placed on one side of the shaft, gave sufficient ventilation to remove the powder smoke from the face of the entries in from 15 to 20 min. After a few weeks connection was made between the two shafts, the steam jet taken out and the brattice removed. While there was a great improvement in the ventilation, it still required from 15 to 20 min. to remove the powder smoke from the face of the entries. A little later I had completed the erection of a 16-ft., double-intake fan, which produced between 80,000 and 90,000 cu.ft. of air per minute, running at a speed of 80 r.p.m. With this large supply of air it still required from 15 to 20 min. to remove the powder smoke from the entries.

One afternoon in September, the temperature dropped from 90 deg. to about freezing point. On arriving at the shaft the next morning, I was informed that the night shift had to discontinue work, owing to the powder smoke, which was not removed from the face of the workings.

This experience teaches me that the rate of diffusion of the powder smoke into the air does not depend on the quantity of the air in circulation, but rather on the density of the air. I believe what is true of powder smoke is true also of marsh gas (CH_4). My conclusion is, supply enough air in the mine to render the atmosphere harmless after diffusion has taken place. This quantity of air should be sufficient to make the mine air safe. In my opinion, any excess of air will do no harm, but a deficiency of air may cause a dangerous mixture to form and result in a disastrous explosion.

I believe if it were possible to heat the intake air current so that its temperature would be the same as that of the mine workings, there would be no more danger of explosions in the intake than in the return airway; and no more danger in undeveloped than in developed mines; and no more danger in the winter than in the summer season.

WM. HARTMAN, Mine Manager,
Southern Coal, Coke & Mining Co.
Belleville, Ill.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

Example—If a difference of pressure between the two ends of an airway, of 8 lb. per sq.ft., produces a velocity of 600 ft. per min., what will be the velocity in the same airway when the difference of pressure is only 2 lb. per sq.ft.?

Solution—In this case, calling the required velocity **x**

$$\frac{x}{600} = \sqrt{\tfrac{2}{8}} = \sqrt{\tfrac{1}{4}} = \tfrac{1}{2}$$

$$x = 600 \times \tfrac{1}{2} = 300 \textit{ ft. per min.}$$

Pressure Producing Circulation—In mine ventilation, the word "pressure" generally refers to the pressure that moves the air. It is the difference between the intake pressure and the discharge pressure. Since the pressure of the atmosphere is equal at both ends of the airway it may be disregarded, as far as the movement of the air is concerned.

The Blowing System of Ventilation—To move the air or cause it to circulate in an airway or a mine, an extra pressure must be created at one end of the airway, so as to overcome the resistance of the mine due to friction. This is called the "blowing" system of ventilation, because the air is blown through the airway by the pressure created.

The Exhaust System of Ventilation—The same difference of pressure may be caused by decreasing the atmospheric pressure at one end of the airway, when the full pressure of the atmosphere at the other end will cause the air to move toward the point where the pressure is less. The principle is that commonly called "suction"; but this system is known as the "exhaust" system of ventilation.

How Pressure Is Produced—Various means have been used to cause a circulation of air in mine airways. The wind cowl, waterfall and steam jet are useful under favorable conditions and where a limited air supply only is needed. The mine furnace, built in the mine near the bottom of the upcast shaft, is often used in nongaseous mines, especially in deep shafts (see Furnace Ventilation). The most reliable means of creating pressure in mine ventilation, however, is the mine fan, which is generally erected at the surface, either at the top of the downcast shaft, as a blower; or at the top of the upcast, as an exhaust fan (see Fan Ventilation). The blowing fan creates a pressure above that of the atmosphere, while the exhaust fan reduces the atmospheric pressure.

How Pressure Is Estimated—In mine ventilation, the pressure producing circulation is estimated in height of air column, as in natural ventilation and often in furnace ventilation. The more common method, however, is to state the pressure in pounds per square foot or ounces per square inch. Pressure is also stated in inches of water gage.

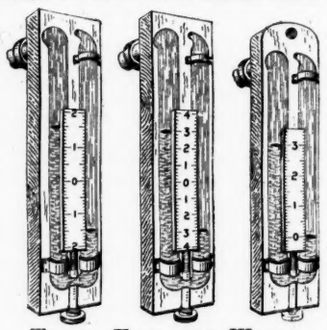
Atmospheric pressure is given in pounds per square inch, or, as barometric pressure (which is the same as atmospheric pressure), in inches of mercury.

1 *in. water gage* = 5.2 *lb. per sq.ft.*
1 *in. mercury* = 0.491 *lb. per sq.in.*
1 *oz. per sq.in.* = 9 *lb. per sq.ft.*
1 *in. mercury* = 13.6 *in. water gage*

The Coal Age Pocket Book

How Pressure Is Measured—In mine ventilation, the pressure producing circulation is commonly measured by means of the water gage; or, in case of high pressures a special form of manometer is sometimes used. The manometer differs from the water gage in having one end of the bent tube closed so that the rise of the water level in that arm of the tube compresses the air above the water, which lessens the rise of water level and gives a greater range of readings.

The Mine Water Gage—This consists of a glass tube of about ¾-in. bore, bent to the shape of the letter **U** and mounted on a solid base. Three styles of water gage are shown in the accompanying figure. These differ only in the kind of scale. The first two on the left have the zero at the center of the scale and read up and down to the respective water levels. The first of these scales is graduated to full-length inches, and to obtain a correct reading it is necessary to add the two readings together, or double either of them, as they are equal. To avoid this necessity the second scale is made of half-length inches, so that either the upper or the lower reading gives the full gage required, which, in this case, is 3 inches.



THREE FORMS OF WATER GAGE

When the zero of the scale is at the middle and the scale reads up and down, it is evident that the scale must be adjusted so that its zero will correspond with the two water levels, before the pressure acts on the gage. When the pressure acts it depresses the water level in one arm while that in the other arm rises an equal amount. The difference between these two levels is the actual water column supported by the difference in the pressures acting on the water in the two arms. As will be explained later, one arm of the gage when in position is open to the intake pressure and the other to the return. The difference between these two pressures is the pressure that circulates the air between these two points.

The scale shown on the right has its zero at the bottom and reads upward. This scale must evidently be set, after the gage is in position, so that the zero will correspond with the lower water level, which is always that in the arm open to the intake pressure, as that pressure is always greater than the return pressure. The reading of the scale at the upper level is then the required gage.

The reading of each of the three gages shown in the figure is 3 in., which indicates a ventilating pressure of 3 × 5.2 = 15.6 lb. per sq.ft.

EXAMINATION QUESTIONS

Bituminous Mine Foremen's Examination in Pennsylvania, May 6-7, 1913

(*Selected Questions*)

Ques.—Why is it necessary to have larger pillars in some mines than in others?

Ans.—The dimensions of pillars, both length and width, are determined by such conditions as depth of cover, character of the roof, floor and coal, thickness and inclination of seam, width of opening, and the presence of gas or water in the roof or floor. All of these conditions affect the required dimensions of room pillars. As these differ in every mine, it is necessary to make the dimensions of the pillars, in every case, conform to the conditions as they exist. The size of shaft pillars depends mostly on the depth of the shaft and the inclination and character of the strata and method of working the seam.

Ques.—(a) What would be the minimum amount of air required in a split in which 70 persons were employed? (b) How would you determine the quantity of air passing, the airway being 8 ft. wide, by 5 ft. high; where would you take measurements, and how and when would you enter them in the daily report book?

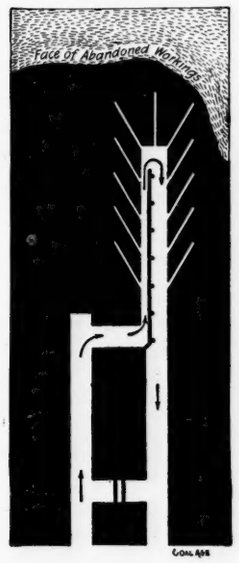
Ans.—(a) The bituminous mine law (1911) specifies a minimum circulation of 150 cu.ft. of air per minute, for each person employed in nongaseous mines. This would require for 70 persons, $70 \times 150 = 10{,}500$ cu.ft. per min. If the mine generates gas in such quantity that it can be detected by an approved safety lamp, the minimum quantity of air shall be 200 cu.ft. per min. for each person employed in the mine; or, in this case, $200 \times 70 = 14{,}000$ cu.ft. per minute.

(b) To determine the quantity of air passing, select a place in the airway where the road is straight and the section uniform, and measures the velocity of the air current at this point, with a good anemometer. An average reading for the entire section of the airway should be obtained by moving the anemometer from point to point in the section, exposing the instrument to the air current an equal period of time at each point. The final reading of the anemometer divided by the time of exposure, in minutes, will give the velocity of the air in feet per minute. This velocity multiplied by the sectional area of the airway, in square feet, will give the volume of air passing, in cubic feet per minute.

The bituminous-mine law requires that the mine foreman shall measure the air once every week, at or near the main inlet and outlet airways and at the last cut-through in the last room, and in the entry beyond the last room turned, such measurements to be taken on days when the men are at work. The mine foreman must also enter plainly and sign with ink, in a book provided for that purpose, a true report of all air measurements taken, designating the place, the area of each cut-through and entry separately, the velocity of the air in each cut-through and entry and the number of men employed in each separate split of air, with the date when the measurements were taken.

Ques.—In driving entries or rooms that are approaching inaccessible old workings, known to contain a body of water, what precautions must be observed?

Ans.—When approaching old workings, a single entry only should be driven ahead, as shown in the accompanying figure. This entry should not be over 12 ft. in width, and a borehole should be kept at least 20 ft. in advance of the face of the entry, and other flank boreholes should be driven an equal distance, at an angle of 30 deg., in the rib of the entry, at intervals of 12 or 15 ft., as the face advances. This single entry should be ventilated by means of a brattice erected 2 ft. from one of the ribs of the entry, as shown in the figure. A close watch should be kept for any increase of water or gas in the strata. Plugs should be kept in readiness to stop any boreholes that may penetrate the old workings. If there is danger of gas, only safety lamps should be used.



HEADING APPROACHING ABANDONED WORKINGS

Ques.—If a volume consisting of 100,000 cu.ft. of air per minute is passing through a mine, how will this volume divide itself between two splits of the following dimensions: Split A, 8x10 ft., 10,000 ft. long; split B, 8x10 ft., 5000 ft. long?

Ans.—The cross-section of these two airways being the same, the perimeters and areas are equal. In splitting, the quantity of air passing in each split is proportional to the split potential $a\sqrt{\frac{a}{lo}}$. In this case, the area (a) and the perimeter (o) being the same for each airway can be ignored and the expression for the potential becomes $\frac{1}{\sqrt{l}}$, which gives, using the relative values 2 and 1, for the actual lengths 10,000 and 5000 ft.,

Split A, $\quad \frac{1}{\sqrt{2}} = \frac{1}{1.414} = 0.7071$

Split B, $\quad \frac{1}{\sqrt{1}} = \frac{1}{1} = 1.0000$

Sum of potentials 1.7071

The quantity of air passing in each split is then

Split A, $\quad \frac{0.7071}{1.7071} \times 100{,}000 = 41{,}420$ cu.ft.

Split B, $\quad \frac{1.0000}{1.7071} \times 100{,}000 = 58{,}580$ cu.ft.

Total 100,000

BOOK REVIEW DEPARTMENT

COAL AND THE PREVENTION OF EXPLOSIONS AND FIRES IN MINES. By John Harger, 176 pp. with index 5½x8⅝; 4 ill.; Cloth boards. Longmans, Green & Co. 443 Fourth Ave., New York. Price, $1.25.

No book on coal mining has excited more comment in the present year than this little volume. John Harger is a man of great originality. We may not agree with him but he stimulates thought and is never dull. He introduces his volume with a fierce attack on the British equivalent of our bureau of mines which he says is conducted "mainly by amateurs." This comes with poor grace from an Englishman in view of the fact that the present safety lamp is a development of the unpractical Sir Humphry Davy, that a predominant type of fan, which revolutionized mine ventilation in its day, was introduced by a clergyman Capell, that our knowledge of mine explosives is largely the outcome of Sir Frederick Abel's investigations and that J. S. Haldane and Leonard Hill have done a great work in discovering means of reducing the unhealthiness of mines under certain untoward conditions. None of the three last-mentioned can by any stretch of a versatile imagination be regarded as practical coal-mine experts. The helmet, also, which has probably the most extensive sale in England was invented by Heinrich and Bernard Draeger neither of whom were mining men. But even more astounding is the coolness with which Doctor Harger overlooks the work of W. E. Garforth in his introduction. Surely this is not because the latter is a mere theorist.

Mr. Harger frequently surprises us with his theories. "In spite," he says, "of its attractive simplicity, we can no longer hold "the peat-to-anthracite" theory which has, in text books at any rate, held such long sway." He is even disposed to accept the bacterial theory of the formation of methane by coal.

Mr. Harger argues in favor of occasional reversals of the air current to remove such dust as is sheltered by projecting ledges of rock and would be unsheltered on reversal. Now W. E. Garforth has declared that coal dust will not rise into a ventilating current unless a velocity of 18 miles per hour is attained. If that is correct for really fine dusts, Mr. Harger's suggestion is not to be regarded seriously especially as he does not say whether he has experimented on the practice he advocates.

The reader will be anxious to see how the author proposes to fill the air of the mine with carbon dioxide and to reduce the percentage of oxygen as suggested in his celebrated address before the British Institute of Mining Engineers. It is probable, if a speedy and effectual devitalization of the atmosphere can be obtained at reasonable cost that the system will be adopted for shotfiring from the surface. Mr. Harger proposes either to use Bone's flameless surface combustion or to pass the waste gas from a boiler fire still heated over bog-iron ore so that the catalytic action will aid combustion, and then over cupric oxide and copper to effect a yet more perfect purification. He also asserts that the discharge of a gas engine can be easily freed from carbon monoxide and might be available.

The book may contain some false conclusions but it is well worth reading. A few original thinkers like Mr. Harger are needed to ferment the mass of stagnant thought.

There has been a disposition to use Mr. Harger with like impatience with that which he has exhibited toward Messrs. Dixon and Wheeler. Because G. A. Burrell and other authorities have shown that his statements relative to gas explosions need qualifications, we should not therefore assume that there is no basis of fact in his statement that under practical conditions explosions especially of coal dust, will not occur if the percentage of oxygen, is reduced to 17 per cent. Let us be reasonably sure, that he is wrong and unentitled to public recognition before we excoriate him.

BIENNIAL REPORT OF THE INSPECTOR OF COAL MINES OF THE STATE OF MONTANA FOR THE TWO YEARS ENDING OCTOBER 31, 1912. Jos. B. McDermott. 66 pp.; 6x9; paper.

The report gives the usual statistics of the production of coal and accidents in mining, together with valuable recommendations and suggestions in reference to permissible explosives, the use in mines of gasoline motors, and the smoke test as applied to illuminating oils used in the mines.

THE COAL TRADE IN 1913. Frederick E. Saward. Cloth, 6¼x8 in., 200 pp. The Coal Trade Journal, 20 Vesey St., New York City.

The fortieth consecutive issue of this bright little book, covering the trade and market statistics for the year of 1912 is again out. As in the case of the previous issues, the book is full of pertinent and useful information to those interested in the coal trade and market conditions. The data included is of a very comprehensive nature, covering temperature statistics, prices, productions, transportation, etc. The book is not, of course, of any particular originality, but it is certainly a handy and quick reference work on the subject covered. In common with previous editions, the most grievout fault to be found is the total absence of any attempt at segregating the different topics into one department. Thus selecting a page at random, say 64, at the top of the page, we find the Baltimore & Ohio R.R. freight rates on coal, which is fololwed by shipments of anthracite according to sizes, and finally the utilization of coal mined in the United States. It would be difficult to conjure up three more irrelevant subjects. Why could not the matter of freight rates all be segregated into one department or one chapter, and likewise the statistics governing the anthracite production and shipments and also that portion relating to the utilization of coal?

GEOLOGIC MAP OF ILLINOIS: Prepared by the State Geological Survey. Size, 34x56 in. Colored; Paper and mounted on cloth.

The State Geological Survey of Illinois, Frank W. DeWolf, director, has recently published a handsome provisional geologic map of Illinois. This map has been compiled from data furnished by the survey staff, and is said to vary in accuracy only with the degree of detail shown.

The map is drawn to a scale of practically eight miles per inch and the several geologic areas are marked in colors. It is stated that since practically the entire state is mantled with drift and associated deposits, the boundaries may be considerably out of place except where detailed surveys have been made, as in Jo. Daviess, La Salle, St. Clair and Monroe counties. The map shows the location of the coal mines of Illinois, and these have been revised by the state mine inspectors under the direction of the State Mining Board. Besides these, there are marked on the map the location of the fluorspar mines, the zinc mines and the petroleum and gas fields, now or formerly active.

There are marked on the map, in different places, the limits of glaciation or the border of driftless areas. Columnar sections for northern, central and southern Illinois are given to a scale of 1 in. = 500 ft. There is also given on the map an outline of the geological history of Illinois, including a brief history of the several rock formations underlying the state. A brief résumé of the economic features of the state is given, showing the quantity and value of the mineral productions, such as coal, petroleum, clay products, pig iron, portland cement, sand, gravel, etc. It is claimed that the mineral wealth of Illinois is practically $150,000,000 annually, and that the state held the third rank among the mineral-producing states in 1911, with coal, petroleum and clay products as the chief items.

Two cross-sections, one in the northern and the other in the southern part of the state, show the general surface to be 500 ft. above sea level. In many cases the altitude above mean sea level, expressed to the nearest foot, is indicated by small figures immediately following the name of the town. These elevations are taken from the U. S. Geological Survey, the Coast and Geodetic Survey, the Army Engineers, and the Mississippi River Commission, all reduced to the 1907 adjustment. The figures refer to the permanent bench marks established by the engineers. Other figures without decimals are derived from railroad profiles and give the approximate elevation above sea level, at railroad stations.

The map is one of which the State Geological Survey can well be proud and shows great care in its compilation. A copy of this map, on heavy paper, will be sent on receipt of 15c., in stamps, to cover cost of mailing. A similar copy, mounted on cloth and sticks, will be sent if, in addition to 16c. postage, there is inclosed money order for 29c. payable to A. J. Nystrom & Co., Chicago. Remittances should be sent to the Director, State Geological Survey, Urbana, Ill.

COAL AND COKE NEWS

Washington, D. C.

Former Secretary of the Interior Walter L. Fisher has discussed with the senate committee on territories the coal question in Alaska during hearings that occurred in the course of the past week relative to the two bills now pending before the committee to authorize the construction of railroads by the Government in that territory. Mr. Fisher said in part:

Now I do not care what the views of members of Congress may be as to the proper way of handling the coal fields. I undertake to say that not one of them, if he will sit down and consider the facts, will conceive that it is possible to open them under existing law. It would be merely offering a premium to the larger financial interests to go in and absorb the existing coal fields and absoluely control them.

For instance, today we know that there are two, and only two, great coal fields in the territory—the Bering coal field and the Matanuska coal field—and we know relatively the area and extent and character of them. Suppose you should open them up to development today; what would happen? You would simply have the men who have the money, and who have the familiarity with the conditions, putting persons in the field to enter these coal lands, so far as they had not been entered, at once. There is no other possibility.

Nobody would do anything so far as the actual development of them is concerned that would be of any value to the country. If the little work which is necessary, even under instruction of the Department of the Interior and the General Land Office with regard to opening mines, were done so that the entrymen were really complying with that provision of the law, it would not put coal commercially on the market. It would merely enable the people who make the entries to acquire title, so they might sit down and wait until a sufficient time had elapsed when they would turn this property over to other people.

Mr. Fisher Favors Leasing

You may have differences of opinion about the leasing system as compared with the ownership of the coal land in fee, but you will find that in Alaska, just as in this country, the inevitable economic tendency will appear, and we will find happening there what has already happened in the rest of the country, namely, the greater portion of the coal lands operated under a leasing system.

Whether we like it or whether we do not, there is no choice between the fee and the leasing system because coal developments in the older states have demonstrated conclusively that private interests prefer to operate under the leasing system, whether the Government does it or not, and your only choice is whether the Government will lease, and lease on terms that will encourage development under effective public control or whether it will turn it over to private interests who will lease, and lease upon the purely financial considerations that will control.

This is capable of demonstration. Mr. Jones or Mr. Smith enters upon a certain tract of coal land, and he gets his title; he complies with the law and gets his patent. Now what does he do? In the great majority of cases he does not operate the coal mine. The statistics are given in the document to which I have referred, and you can have it readily brought down to date by the Bureau of Mines. What he does is to turn it over to a lessee, corporate or individual. It may be that the property will pass through a succession of transfers before the coal is finally commercially operated. If it does, each transfer means that the party who sells exacts a profit from the party who buys, and, finally, when the lease is made and the operator begins to take out coal he does so upon a royalty basis which pays the carrying charges upon the profits made in the whole series of intermediate transactions.

The result is, as has happened in the bituminous coal fields throughout the Central West that many of our coal mines are being operated upon terms that leave the operator just a chance to make a living. Many of our coal fields are being operated under existing private ownership by a private lease system, under which the operator can just work through. And what happens? The trade itself is utterly and hopelessly demoralized, because every time there is a falling off in the demand for coal, there is a decline in our general prosperity, so that there is less manufacturing and less use for coal. These coal lessees who have taken over these properties upon terms which just give them a chance to live, usually have notes at the bank, or have to meet their obligations to their lessors, and they must sell coal. They put their coal on the market. They glut the market and the result is that there are times of plenty and times of scarcity, with the miner being thrown out of employment, and with all of the evils that associate themselves with our coal development, and to a certain very considerable extent, with our lumber development in this country.

The system does not work properly, and if men in the coal business both in Pennsylvania and in the Far West will talk to this committee as they have talked to me, there would not be any real difference of opinion as to what ought to be done.

They will all be agreed upon the proposition that the way to handle these fields is to have the Government lease them, and lease them upon terms which will encourage development, will protect the operator, and will give him a far better chance in the practical operation of the coal mines than he can possibly get under the existing system. You do not propose to throw this coal land open under the present law except in very small quantities, so small that it is not profitable, so small that certainly if there is any operation it is upon the most uneconomic basis.

The Question of Economy

We want to have our coal mined so as to prevent waste. Talk to operators as I have talked to them, and they will tell you "we would like a law of this kind to prevent waste, but here is a vein where the physical conditions are such that if we go in and take that coal out now it is going to cost us a whole lot of money. The coal market is low; there is a glut. We cannot afford to do it. It is theoretical. We ought to take out all the coal from the mine and we ought to take it out as we go, but practically we cannot do it. We could not meet commercial competition and do it."

We have already parted with the greater portion of our coal land in this country. Fortnately, we have still a considerable area in the West. Fortunately, many of the western states have considerable areas of coal land belonging to them, and it is significant that all of those states are operating under a leasing system, some of them prohibiting the disposal of their coal land under any other than the leasing system. If you will take the state laws throughout the West and examine them, and see what the states believe they ought to do with the coal land, you will observe that there is a practical unanimity of opinion that it ought to be handled under the leasing system.

Of course, the object of the whole law ought to be to get coal to the consumer as cheaply as it can consistently be done with a proper return to the people who are developing the mines and making the investment. You ought to offer to those people such a return upon their money as will be a sufficient inducement to them for the development of the property, whatever it is. If you offer them any more than that it is gratuity.

There is going to be very litle pioneering about any of this coal land, especially in Alaska, and this is true practically of all the coal land that we have left in the hands of the Government, either the Federal Government or the state governments. It is not the ordinary case of the prospector who starts out with a pick and shovel and goes out through the wilderness and finds a vein containing precious metal.

The difficulty with our coal laws is that they proceed upon the theory that coal land is just like precious-mineral land. We have tried to make the laws the same, and we have modified the mineral laws just as little as possible so as to meet conditions in the coal fields.

Concerning a Government Railroad

I think the Government can afford to build a railroad in Alaska, which perhaps private capital could not afford to construct, because of the difference between the rate of interest that private capital would have to pay and the rate of interest which the Government would have to pay. I think that is a sufficient reason for the Government building this road.

PENNSYLVANIA

Anthracite

Scranton—Two thousand mine workers at the Sterrick Creek colliery of the Temple Iron Co., in Jessup, are on strike because the hoisting engineers and a number of others have not joined the union. The union officials say that the strike is not authorized.

Shamokin—Between 7000 and 8000 men and boys, who have been idle at the collieries in this region have returned to work. The strike caused a general tie-up in the various collieries.

Bituminous

Harrisburg—Ten additional mine inspectors are provided for the anthracite field in a bill which has passed the House by a vote of 135 to 5. The bill was presented by Mr. Lenker, of Dauphin, who declared that, in view of the fact that 614 men were killed in the mines during 1911, he believed that there was a need for more inspectors.

Monongahela—The old Domestic coal tipple which has been a landmark on the East Side for a number of years has been torn down. Only a little coal has been run over the tipple during the past five years.

Washington—A large barn at the Vigilant mine of the Pittsburgh Coal Co., at Coal Center, was destroyed by fire May 6. All the mules and horses were rescued. The cause of the fire is a mystery. The loss is estimated at $5000.

Uniontown—The magazine of the Sunshine Coal and Coke Co.'s mine exploded at 1 o'clock, in the afternoon of Saturday, May 10, killing 3 persons and injuring 40, of whom 22 were seriously hurt. The plant is three miles from Masontown, Fayette County. The magazine contained 500 sticks of a dynamite powder. The general store, the home of Francis Rocks, an official of the company and 25 small dwellings were made uninhabitable. The magazine was about 25

yd. from the store and the Rocks home. Two men, both killed were in the magazine. The loss is $75,000.

Du Bois—The miners at the Buffalo & Susquehanna Coal & Coke Co.'s mines Nos. 1 and 2 are on strike to secure better wages for the firemen who work 12-hour shifts for $2.42 per day. Superintendent James Harvey has refused to accept a checkweighman as representative of the men, claiming he is not an employee. A commission composed of J. S. Forsythe for the operators and W. Broad for the miners will hear the arguments relative to the checkweighman's elegibility to the pit committee.

WEST VIRGINIA

Charleston—A special train in charge of a representative of Governor Hatfield has transported many miners from tents along Cabin and Paint Creeks to various mines throughout Kanawha County, where employment awaited them. The men and their families have been living in tents since the beginning of the strike, in April, 1912.

The Governor has announced that he would place a number of special guards in the former strike zone to do police duty, but that no mine guards would be permitted to act as police. He added, however, that he could not and would not attempt to prevent property owners from employing persons to guard their own properties.

VIRGINIA

The one most serious obstacle to the mining industry in Virginia is the difficulty experienced by the operators in getting sufficient men to work the mines. The West Virginia and Pennsylvania mines absorb nearly all the foreign-born workers, and those states give special attention to provisions for the welfare of the miners by providing hospitals for them where they may be cared for at the State's expense in case of serious accident or illness. In Virginia, while some of the mining companies are strong enough to provide and maintain hospitals for their men, many of them are not; and the lack of such, prevents many from coming to this state who would otherwise prefer to work in the thick, gasless mines of the southwest counties.

KENTUCKY

Louisville—Traffic officials of the Louisville & Nashville R.R. Co., with a number of interested business men as their guests, took an inspection trip last week over the Louisville & Eastern region. They were especially interested in the new operations of the Consolidation Coal Co. in that section. The trip was made in a special train, which left Louisville on the evening of May 9.

Hartford—Five men were killed May 6 in a deserted shaft of a coal mine belonging to the Taylor Mining Co. The men were exploring an abandoned portion of the mine, when one of their number fell into some water. The four others went to his rescue, but were overcome by blackdamp before anything could be done.

TENNESSEE

Chattanooga—The reunion of the United Confederate Veterans will be held at Chattanooga, May 27 to 29. Great preparations are being made to properly entertain the survivors of the great struggle, whose ranks are thinning so rapidly. Owing to the low railroad rates local manufacturers expect that many of their distributors and suppliers, as well as many coal operators, will pay the city a visit about that time.

OHIO

Bridgeport—The strike of 2000 miners of the Lorain Coal & Dock Co. which started two weeks ago was settled May 6. The men demanded pay for all roll cutting where the stone is more than 10 in. thick and gained their point. The strikers resumed work at once.

Martins Ferry—The fan house at the Florence mine, two miles west of this place, was burned May 9, causing a loss of $2000. Four hundred miners will be thrown out of employment for two weeks. The origin of the fire is unknown.

MISSOURI

Jefferson City—Governor Major has announced the appointment of deputy mine inspectors as follows:

For the coal mines of the state—Benjamin B. Fischer, of Lexington, and Evans Jones, of Higbee.

FOREIGN NEWS

Halifax, N. S.—The miners of the Acadia Coal Co. at Stellarton have left work to interview the management concerning the reinstatement of one of their number. They claim that he was asked to vacate one of the company's houses while sick in bed.

Vancouver, B. C.—A strike of the coal miners in the Nanaimo area has been ordered by Frank Farrington of Seattle, representative for the Pacific Northwest of the United Mine Workers of America. The collieries affected employ a total of 2500 men.

PERSONALS

C. P. Ludwig, general manager of the Alabama Iron Co., has tendered his resignation, to take effect May 31.

Willis S. Holloway, who has had 15 years' experience in designing and installing coal-handling and conveying machinery with various firms is now associated with the Roberts & Schaefer Co., of Chicago.

The Hisylvania Coal Co., which has offices in the Capitol Trust Building, announces the appointment of Thomas D. Jordan as the Western sales agent of the company, with office at 1255 Old Colony Building, Chicago.

Robert Leitch, chief chemist at the Scottdale furnace of Corrigan, McKenney & Co., has been transferred to Charlotte, N. Y., to become superintendent of the company's furnace at that place. E. Guy Wentsluer will take his place at the Scottdale plant.

E. P. Laughrey, who has been chief clerk at the Scottdale furnace of Corrigan, McKinney & Co. for the past several years, has been promoted to the position of superintendent. Mr. Laughrey succeeds W. H. Everhart, who has been made superintendent in the Cleveland works.

Paul W. Holstein has recently been appointed by the Roberts & Schaefer Co., of Chicago, to have charge of its coal tipple and washing plant construction and contracting business in the West Virginia field. He has had several years' experience along these lines for other companies.

Mine Inspector Richard Maize, Jr., of Somerset, has been appointed superintendent of all the operations of the United Coal Co. in Somerset County, including those in Boswell, Jerome and Orenda. He succeeds John Gibson, Jr., who has been made general superintendent for Pennsylvania, Maryland and West Virginia.

W. C. Redfield, formerly vice-president and director of the American Blower Co., has been appointed a member of President Wilson's cabinet. Mr. Redfield has deemed it advisable to terminate his business connections with the company and has retired from active participation in its management.

W. H. Burke, formerly purchasing agent of the Illinois Traction System, and for the past year and a half fuel agent for that system and general manager of the Kerens Donnewald Coal Co., has resigned to accept a position as secretary and treasurer of the Roberts Motor Co., at Sandusky, Ohio. He is succeeded by J. A. Jeffries, formerly of the Williamsville Coal Co., of Williamsville.

TRADE CATALOGS

Draeger Oxygen Apparatus Co., 422 First Ave., Pittsburgh, Penn. The Draeger Pulmotor. Ill., 32 p., 6x9 in

The B. F. Goodrich Co., Akron, Ohio. Pamphlet. "Longlife" conveyor belt. Ill., 5½x8½ in.

Department of Mines, British Columbia. Preliminary Review and Estimate of the Mineral Production, 1912.

Otis Elevator Co., 8th Ave. & 26th St., New York. Catalog. Incline railways and skip hoist machines. Ill., 28 p. 6x9 in.

C. W. Hunt Co., West New Brighton, S. I. Catalog No. 12-9. Hunt noiseless gravity bucket conveyor. Ill., 64 p., 7x9 in.

The C. S. Card Iron Works Co., 1601-1679 Alcott St., Denver, Colo. Catalog No. 16. Coal handling machinery and equipment. Ill., 72 p., 6x9 in.

The Electric Service Supplies Co., Philadelphia, Penn.; booklet illustrating and describing the automatic trolley guard, a new specialty which it has recently added to its broad line of electric railway equipment.

Guarantee Construction Co., 140 Cedar St., New York. Pamphlet. Economic Handling and Storage of Coal and Ashes in Power Plants. Illustrated, 40 p., 6x9 in. Pamphlet. Retail Coal Pockets and Mechanical Screening Plants. Ill., 36 p., 6x9 in.

National Tube Co., Pittsburgh, Penn. New edition, Matheson Point Pipe Booklet. 40 pp.; numerous illus. The various advantages of this pipe are enumerated as follows: Reduced weight, greater bursting strength, saving in lead per mile, adaptability to vertical curves and the advantages of National coating.

The Witherbee Igniter Co., Springfield, Mass. Booklet on Wico Safety Electric Lamps. 12 pgs., 3x6 in., illustrated.

This is an electric head lamp operated by a storage battery carried on the belt. The accumulator, it is claimed, is the lightest and most compact device of its kind and capacity known, weighing but 2 lb. 4 oz. and giving a continuous light for 12 to 14 hours at one discharge.

NEW PUBLICATIONS

U. S. Bureau of Mines. Bulletin 46. An investigation of explosion-proof motors. By H. H. Clark, 1912. 44 pp., 6 pls.

U. S. Bureau of Mines. Technical Paper 28. Ignition of gas by standard incandescent lamps. By H. H. Clark, 1912. 4 pp.

Western Society of Engineers, Journal for April, containing paper on, "The Cause of Floods and the Factors that Influence their Intensity," "Investigation of Flood Flow on the Watershed of the Wisconsin River," "The Desirability of revising the Rating and Methods of testing Electrical Apparatus," etc.

"The Electron Theory of Magnetism," by E. H. Williams, has just been issued as Bulletin 62 of the Engineering Experiment Station of the University of Illinois.

This is a mathematical discussion of the new theory of magnetism. The bulletin traces the experimental evidence leading to the development of this theory, defines its present status, and points out certain phenomena which the theory in its present form fails satisfactorily to explain.

Copies of Bulletin 62 may be obtained upon application to W. F. M. Goss, director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

CONSTRUCTION NEWS

Minneapolis, Minn.—The Sullivan Coal Co. is planning to erect a 5000-ton automatic coal elevator on the Milwaukee tracks at Lyndale Ave. and Twenty-ninth St. The cost is to be in the neighborhood of $16,000.

Gary, W. Va.—The U. S. Coal & Coke Co. has let a contract for an annex of 8 rooms to be added to the Gary clubhouse. The dining room will also be enlarged to have a seating capacity of 60 at the tables.

Bellaire, Ohio—The contract for rebuilding the power house of the plant of the Franklin Coal Co. at Stewartsville, Ohio, has been awarded and the work will be rushed to completion. The power house was destroyed by fire recently.

Lorain, Ohio—The Baltimore and Ohio Railroad Co. has started the work of rebuilding the coal docks at Lorain. The docks, especially No. 1 was badly damaged by the recent flood. Repairs will be made to dock No. 2 which was also damaged by the high waters.

Battle Creek, Mich.—Twelve new coal sheds, 200 ft. long and having a capacity of 960 tons, will be erected in the near future by the J. O. Davis & Son Coal Co. It is understood that the company will not let any contract for the work but will undertake the construction itself.

Sparrow's Point, Md.—The Maryland Steel Co. has just placed contracts for additions to its byproduct coke and gas plant. The new ovens will be of the Koppers' type and will be constructed at once. When this work is finished the company will be equipped with sufficient coke capacity to supply its needs for fuel and give it abundant byproduct gas as well.

Wyandotte, Mich.—The Eberts Bros. Co., dealers in fuel and builders' supplies, has purchased the entire block of river front property between Poplar and Walunt streets. A dock, almost a block in length, will be erected, which will be equipped with modern devices for unloading vessels, including a large steam crane. A mammoth fireproof storage building will be erected at one end of the property.

Pittsburgh, Penn.—Plans for the new cofferdam to be erected in the Ohio River at Dam No. 9 have been received at the offices of the Pittsburgh Coal Exchange. There will be 435 ft. of open channel for navigation between the outer face of the cofferdam and the river wall of the lock. For spillway purposes there will be 100 ft. opening off from the lock chamber. The contract has been awarded to the National Contracting Co. and the work will be completed by Oct. 1.

Duluth, Minn.—The new steel plant at Duluth is to build an immense storage yard for coal and limestone in the near future. The yard will be 1000 ft. long by 600 ft. wide and will have sufficient capacity to store all the necessary supplies. It has been officially announced that three additional open-hearth furnaces will be constructed at a cost of $760,000, together with another reheating furnace. There will be 90 coke ovens in the new plant with a capacity of 1000 tons of coke per day. These are now in the course of construction.

NEW INCORPORATIONS

Cheyenne, Wyo.—The Cedar Grove Coal Co. has recently filed articles of incorporation. Capital stock, $300,000.

Austin, Tex.—The Sherman Gas, Light & Fuel Co. of Maine; capital stock, $200,000. Permit granted to do a business in Texas.

Youngstown, Ohio—The Brier Hill Coal Co. has filed papers with the secretary of state increasing its capital stock from $50,000 to $500,000.

Dayton, Ohio—The Service Coal Co., of Dayton, has filed papers with the secretary of state decreasing its capital stock from $50,000 to $5000.

Brazil, Ind.—The West Side Coal Co.; capital stock, $5000; to mine coal. Incorporators: C. H. Zellar, Lena Zellar, B. F. Schrepferman and M. D. Schrepferman.

Louisville, Ky.—The White Oak Coal & Coke Co. of Kentucky; capital stock, $25,000. Incorporators: C. S. Maddis, W. H. Kurk, C. A. McKamey and H. S. Phillips.

Youngstown, Ohio—The Reserve Metal & Coal Co.; capital stock, $10,000; to deal in junk, old iron, coal, etc. Incorporators: Mary Roland, Minnie Sussman, A. B. Calvin, H. G. Bye and B. L. Smith.

Woodward, Tex.—The Farmers' Coal, Grain & Elevator Co.; capital stock, $5000. Incorporators: I. J. David, G. A. Stuart, J. I. Carpenter, D. P. Thacker, W. A. Campbell, W. R. Smith, and J. H. Hamilton.

Clinton, Ind.—The West Clinton Coal Co. has been incorporated here, with $150,000 capital stock, to mine coal. The directors are John Shirkie, Steward Shirkie, S. P. Hancock, G. H. Bridges and Henry Adamson.

INDUSTRIAL NEWS

Sullivan, Ind.—The Princeton mine, owned by the Consolidated Indiana Coal Co. is to be reopened. The machinery has been removed from the Keller mine.

Blairsville, Penn.—It is rumored that the Buffalo, Rochester & Pitsburgh R.R. is about to be extended from Josephine, through Blairsville to Latrobe and perhaps further.

Manilla, P. I.—E. Randolph Hix states that the Phillipine Coal Consumers' Association has just been formed and is about to ask for bids on $1,000,000 (gold) worth of coal.

Punxsutawney, Penn.—The H. C. Frick Coke Co. has ordered the firing of more ovens at Dorothy. This will make a total of 210 ovens in operation in the Westmoreland region.

Altoona, Penn.—The Altoona Coal & Coke Co. is preparing to place in operation its coking plant of 100 ovens at Coupon, Cambria County. The plant has been out of commission for some time.

Evansville, Ind.—Fire at the Ingle coal mines, near Evansville, destroyed the boiler rooms at the power plant, with a loss of more than $15,000, and also did considerable damage to the mine shaft.

Cincinnati, Ohio—The directors of the Mahoning Coal R.R. Co. have declared a dividend of $25 a share on the common stock, payable May 15. The majority of the stock is owned by the Lake Shore R.R.

New Lexington, Ohio—The Common Pleas Court, of Perry County, has ordered the sale of the property of the Saltillo Coal Co. at auction, June 7. The property consists of several tracts of coal land in Perry County.

Connellsville, Penn.—The Indiana Coal Mining Co., whose operation is located at Lockport, on the Westmoreland County side of the Conemaugh River, is now working a new operation on the Indiana County side of the river.

Lexington, Ky.—Colonel Tierney, head of the Elkhorn Coal Co., has just purchased a large tract of coal land on Pond Creek and will soon open 15 mines there. These mines will have a capacity of about 15,000 tons a day.

Brazil, Ind.—The Indiana Clay & Coal Co. has filed a petition for a receiver in the Circuit Court. The company operates a coal- and clay-stripping pit near Patricksburgh, but this has not been in operation for two months.

Belleville, Ill.—The county mine examiner has ordered the Little Oak Mine closed because the wood work of the mine was decayed and the tipple in a dangerous condition. Three hundred miners are thrown out of employment.

Joliet, Ill.—The Joliet Coal Products Co. is considering the expansion of its operations at a cost of $375,000. The plant now consists of 35 byproduct ovens. The plan is to build an additional 36, thereby more than doubling its capacity.

Johnstown, Penn.—Negotiations have practically been closed for the purchase of about 6000 acres of virgin coal in Green and Cherryhill Townships, Indiana County. The identity of the purchasers is being kept secret. An average of $60 an acre has been offered for the coal and the deal means the transfer of $360,000.

Reading, Penn.—The Reading Coal & Iron Co. is still storing coal at Abrams and Landingville. The mines, however, are working full and are likely to continue during May. It is reported that the eastern and western states are storing large quantities of anthracite, and this accounts for the activity at the mines.

Birmingham, Ala.—The New Orleans & Northeastern R.R. and Alabama & Vicksburg R.R. have placed together with the Corona Coal & Iron Co. probably the largest individual coal order in the history of Alabama. The order calls for 600,000 tons to be shipped at the rate of 25,000 tons per month over two years, beginning July 1, 1913.

Johnstown, Penn.—It is said that the Berwind-White Coal Mining Co. is about ready to purchase the holdings of the Jed Coal & Coke Co., near Welch, W. Va., for $300,000. This property has been in the hands of a receiver for a year. Should the court confirm the sale, it is said that the Berwind company will spend $200,000 on improvements.

Lorain, Ohio—The American Ship Building Co. has arranged to launch the new freighter, "A. C. Dustin," which was built at the Lorain yards of the company in the near future. The vessel is named after A. C. Dustin, of the firm of White, Dustin & Kelly, admiralty attorneys, of Cleveland. The "A. C. Dustin" is 545 ft. long, has a beam of 58 ft., and a draft of 31 ft.

Shenandoah, Penn.—The Philadelphia & Reading Coal & Iron Co. is experimenting with a new carbide gas lamp for use in its mines. It is expected that this new lamp will do away with the old oil-burning lamp. The miners who have used the new lamp say that it is far superior to the old-style lamp. It gives a much brighter flame, in addition to being cleaner and safer.

Manhattan, Kans.—The Rocky Ford Power Co. has devised a scheme for getting its coal across the river from the Blue Valley R.R. track to its plant. Large iron pipes, supported by cables, will span the river. The coal is fine and is washed through the pipes under pressure.

The Rocky Ford company is abandoning its water-power machinery for steam power.

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. is preparing to reopen the old Anchor mine at Heckscherville. The mine was abandoned 40 years ago and has remained full of water since that time. It is now planned to install pumps and drain the mine. When in operation the output will be hauled by motor to the Thomaston slope and conveyed on the main line to the Pine Knot breaker.

Spottsville, Ky.—The work of pumping the water from the coal mines at Spottsville, Ky., on the Green River, which were flooded during the high water last month, has been started and it is hoped to get the workings cleared in time to resume work before long. It is said that many of the men formerly employed in the mine have left the town, being under the impression that work would not be resumed in the mine.

Scranton, Penn.—The plant and business of the Scranton Steam Pump Co. was recently purchased at a receiver's sale by a committee representing 98 per cent. of the creditors. The total price paid was in the neighborhood of $400,000. This firm was forced into receivership by a combination of financial difficulties and not by any inferiority of its product. The business will be continued and it is believed that in a short time it will again be on a paying basis.

Alliance, Ohio—Mayor B. F. Hennacy has been taking options on coal lands in this vicinity. At present he has 2000 acres in Elkrun Township and more than 3500 acres in Salineville.

Tests have shown that there are rich beds of coal underlying the land in Elkrun Township, and it will probably not be long before mining operations are begun there. It is understood that Mayor Hennacy's purchase is merely an investment.

Pineville, Ky.—The Continental Coal Corporation, operating extensive properties in southeastern Kentucky, especially in the vicinity of Pineville, has moved its Louisville offices into new and commodious downtown quarters at 217 South Fifth St., between Market and Jefferson. All of the business of the company in Louisville will henceforth be handled from the office referred to, only a yard manager being left at the yards, where the office was formerly located. The central office will be in charge of L. A. Powell, who has been local manager for some time, and the company's branch offices will remain as before.

Connellsville, Penn.—Beginning with May 1, the output of Vesta No. 5 mine of the Vesta Coal Co. is to be shipped by rail. The new arrangement has been caused by the closing for repairs of one of the locks at Lock No. 4 on the Monongahela River. The other mines of the Vesta company will ship by river as at present. A siding has been placed to hold 50 cars at the Vesta No. 5 mine.

The tipple at this mine was designed for river as well as rail shipments. For this reason the contemplated change will mean but little additional expense. The mine is turning out about 3100 tons a day.

Winchester, Ky.—Coal and timber lands in Tennessee to the extent of about 41,800 acres have been sold by H. C. Thompson, of Winchester, to J. A. Smith, Roger E. Miles and W. A. Odell, representing Cleveland and New York interests. The price paid is said to have been about $400,000. Mr. Thompson also holds an option on 50,000 acres of coal lands on the South and Middle Forks of the Kentucky River, which he may sell to the same parties. The latter will make an investigation of the property, and, if favorably impressed, will close the deal, and immediately arrange for the building of a railroad through it to open up mines.

Indianapolis, Ind.—After long working of the coal fields of Greene, Clay and Sullivan Counties, it is reported capitalists are planning to push further south into Knox, Pike, Gibson and Warrick Counties and electric roads are being promoted. The most promising looking one at present will extend from Boonville to Lynnville and thence through Petersburg and Washington to Indianapolis. It is further said the Pennsylvania and Monon contemplate building into the new fields, the American Coal Co., supposed to be closely associated with the Monon, having leased several thousand acres of coal land in Knox County, near Wheatland.

Connellsville, Penn.—Steps are being taken to wind up the affairs of the Great Lakes Coal Co., which operates in Butler and Armstrong Counties. The company went into the hands of receivers some time ago, following a strike of its miners for a union wage scale and working rules. The property is now advertised for sale at auction in the Allegheny County court house, May 29. It consists of 22,133 acres of coal in Butler and Armstrong Counties, together with 685 acres of surface land, mines, tipples, etc., and 20,000 shares of stock of the Allegheny & Western R.R., at $50 par. It is likely that some effort will be made to reorganize the property and develop it.

Birmingham, Ala.—The Maryland Coal & Coke Co., recently organized, owns 15,000 acres of coal land in the Warrior field, about 30 miles west of Birmingham, which is being developed for a daily output of 2000 tons. The Frisco system is extending its Empire branch a distance of 7 miles to reach the scene of operations. A model mining town, consisting of 250 houses, is in the course of construction. Electric locomotives and mining machines will be used.

The seam which is being developed is known to the Warrior field as the Black Creek seam. It is 3 ft. thick, and is very hard. It is expected that shipments will begin between July 15 and Aug. 1.

COAL TRADE REVIEWS

GENERAL REVIEW

A distinct feeling of uncertainty pervades the hard-coal trade. May shipments, at some points, are falling behind those for April, with the result that there is not so much free coal offered as when the spring circular went into effect; requisitions at such points and for certain grades are subject to indefinite delays. On the other hand, rumors are current that some producers are experiencing difficulty in obtaining sufficient orders to cover their production, although such rumors are indefinite and have not been established. A period of mild depression during the mid-summer seems probable, but the situation is not to be regarded as serious, providing there is no pronounced cessation of industrial activity. Troubles between operators and miners has acted as a balance and tended to keep production down to the consumption.

In the coastwise bituminous trade, the larger buyers are beginning to lose hope of compelling the operators to recede from their higher prices on contracts and a few have signed up for a short period, evidently in anticipation that there will yet be a break in the market a little later. However, the trade, generally, is in better shape in all directions; less is heard about deferred buying, and operators, as a rule, continue withdrawing their bids, probably believing that they would rather curtail production for the time being, and have some free tonnage available when the higher prices prevail.

The Pittsburgh market is becoming steadily stronger with producers asking for substantial advances over the season's prices, although the regular circular is being maintained on contracts with old customers. The car supply is good, the lake shipments are steadily increasing, while production is at the highest point of the year, and would be still greater were labor conditions more favorable. It is seldom that buyers have ever been so eager, and there is nothing to check the heavy consumption except some highly adverse legislation is enacted by the new administration.

The accumulations at Hampton Roads are still about normal, but have been considerably reduced by a heavy movement into both the foreign and coastwise trade. Steam grades in the Southern market have become still heavier, with sales of small tonnages being reported at remarkably low figures; business such as this reflects adversely on the market. The domestic trade has become a trifle more buoyant, on the strength of a stocking up movement on the part of the dealers.

The Eastern producers are moving a heavy tonnage into the Middle West, where the dealers are anxious to acquire stocks while the summer circulars are still in effect. On the local coals, there has been a slight letup on domestic, with steam grades about normal; many contracts for the latter are being renewed. Dealers are pushing business while prices are low, and consumers are responding about as usual. Chicago has experienced some price cutting, with the result that quotations have fluctuated over a large range. There has been considerable contracting for Eastern fuels.

BOSTON, MASS.

Bituminous—On the whole the market is perceptibly firmer than a week ago. All reports are that Pocahontas and New River are being firmly maintained at $2.85 f.o.b., and this notwithstanding large accumulations at the Hampton Road piers. Corporation buyers are coming into the market for a share at least of their annual purchases, and there is a tendency to buy enough now to carry over into the season when concessions will be made, if there are to be any. The market is in much better shape in all directions, and it bids fair to continue so for the present at least.

The Pennsylvania coals of the better grade are well supplied with orders, and shippers are still withdrawing quotations left out a fortnight or more ago. Georges Creek is also firm on the season-contract basis; in fact, there are few weak spots all along the line. All-rail, and for inland shipment from tidewater points there is a decidedly better tone. Less is heard about deferred buying than was current a few weeks ago.

Water Freights are also somewhat firmer than when last reported; 75c. and 80c. have been paid this week for large vessels, Hampton Roads to Boston.

Anthracite—May shipments are so far very much behind those of April, and it looks like a month of relatively small tonnages. Loading is slowing up and the companies are not as free with the various sizes as they were at the opening of the season. Stove is notably short, and schedules calling for much of this size are entered subject to indefinite delay. Pea is also hard to get and New England dealers, especially those with relatively small storage, are getting apprehensive with such reports thus early.

Current bituminous quotations at wholesale are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.00@1.35	$1.25@1.45	$1.67@1.77	
Philadelphia*	2.25@2.60	2.50@2.70	2.92@3.02	
New York*	2.55@2.90	2.80@3.00	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				$2.85
Providence†				$3.73@3.78
Boston†				3.78@3.90

*F.o.b. †On cars.

NEW YORK

Bituminous—The soft-coal market continues in a rather lifeless condition without, however, any appreciable loss in strength. In view of the rather unfavorable conditions, operators are maintaining prices remarkably well. There appears to be a uniform restriction in production on the part of all large producers and a firm determination to obtain profitable figures for their product; when such prices cannot be obtained the business will not be accepted. Consumers are showing a disposition to buy for their current needs in the spot market in anticipation of being able to contract at lower figures later in the season.

Production at the mines appears to have fallen off slightly during the week, but this is probably only a temporary depression. Car supply, as usual, in times of light demand, is more than sufficient to meet requirements. Stocks at tide are about normal. Some odd tonnages of low-grade coal can be picked up in the market at very low prices, but such conditions are the exception rather than the rule, being due to some unusual features, such as demurrage. The market is not quotably changed from last week, which prices we continue as follows: West Virginia steam, $2.55@2.60; fair grades, Pennsylvania, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—Well defined rumors are current to the effect that some of the hard-coal producers are about caught up on their orders and will have to curtail production shortly unless more business appears. These conditions have not assumed definite or tangible proportions as yet, and, as a matter of fact, most companies have sufficient business on hand to keep them going steadily at maximum capacity up into July or August. Nevertheless, it is clear to all that there is not the customary activity on the part of the buyers, and there is a distinct undertone of uncertainty over the future of the summer business, but of not sufficient proportions to create any serious alarm over the situation.

Mines continue working up to full capacity, and the "button strikes" seem for the time to be less frequent. Monday of the current week was generally acknowledged as a holiday throughout the mining regions, and another occurs on the 30th of the month, which is Friday; this virtually means two days lost time since Saturday will doubtless see a very light force out, and the consequence is that production for the month will probably fall off below that for April.

The New York hard-coal market is quotable about on the following basis:

	Circular	Individual	
		Lehigh	Scranton
Broken	$4.60	$4.45	$4.50
Egg	4.85	4.80	4.85
Stove	4.85	4.80	4.85
Chestnut	5.10	4.95	5.00@5.10
Pea	3.50	3.30@3.35	3.35@3.50
Buckwheat	2.75	2.10@2.45	2.50@2.75
Rice	2.25	1.85@1.95	2.25
Barley	1.75	1.40@1.70	1.70

PHILADELPHIA, PENN.

The coal trade in this vicinity had a slight impetus early this week because of the weather which was the coldest experienced in this vicinity and at this time during the last forty years. It caused many anxious eyes to turn toward coal bins, and resulted in the consumption of considerable coal, which was supposed to be in the nature of a nest egg for next winter. The current business, however, still continues about the same as last week. There is no unusual call for coal, and dealers are being supplied regularly with all of their requirements. From the present indications, however, May is likely to absorb all of the production of the prepared sizes; steam grades still continue to be piled up in the storage yards of the large operators, the demand having fallen off considerably.

Taking it altogether, however, the month of May thus far has been as good as anyone expected, and possibly a little better, with the prospects of continuing so for at least the balance of the month. Up to the present, there has been less reports of concessions by the individual operators than has been the case in many years. The production continues on about a parity with May, 1911, and the little difficulties occurring between the operators and miners, mostly on account of some trivial difference, has had the effect of a balance wheel, in keeping the production within the demand. Considerable coal is still being diverted from the Eastern market into the Northwest, from the Lake shipping ports, and this in measure lessens the strain on the Eastern selling forces.

The bituminous market in this vicinity does not seem to improve as rapidly as was expected. The low ebb reached some weeks ago, was not followed by any appreciable increase in prices, but the demand is good. Optimistic views are expressed that the tangled market of the last two or three months, is the precursor of summer conditions at variance with the customary market at that time. Slack coal seems to be the most erractic, declining in some cases anywhere from 15 to 25c. per ton, and the demand not particularly active at that.

PITTSBURGH, PENN.

Bituminous—The market is still stronger. While the majority of operators are asking an advance of 10c. over season prices to buyers not their regular customers, as noted a fortnight ago, prompt lots are frequently quoted at as much as 20c. advance. On regular contract trade, however, the circular prices continue to be done with favored buyers. Production is on a slightly heavier scale, and is at the best rate of the year, but would be still greater if labor were in a more equable mood. There is much unrest, which is growing and promises unusual difficulty for the next scale settlement, for the period beginning Apr. 1 next, while the occasional local outbreaks do not become less frequent. Car supply is fairly good, there being complaint in a few quarters. Lake shipments are increasing week by week. We quote: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30@1.40; ¾-in., $1.40@1.50; 1¼-in., $1.55@1.65, per ton at mine, Pittsburgh district.

Connellsville Coke—The trade is remarkably steady, having shown no definite change for three or four weeks, which is quite unusual with so mercurial a market. The majority of operators have their minds set on $2.25 for prompt furnace coke and $2.50 for contract. There being light demand for prompt, this has resulted in slight shading, generally to $2.10 to $2.20, with only occasional sales at $2 and few, if any, at the regular asking price of $2.25. The contract asking price might be similarly shaded if consumers were forced to act, but they are not. No contract business needs to be placed for delivery beginning earlier than July 1, and furnaces expect more than a small concession from the asking price. Prompt foundry coke has weakened slightly by operators not usually making this grade offering limited quantities at cuts from $3, which has been the minimum asking price of regular markets, some adhering to $3.25. We quote the market: Prompt furnace, $2@2.25; contract furnace, $2.50 asked; prompt foundry, $2.85@3.25; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

There has been a great demand for gas coals in the local market, particularly the better grades and shipments to the West have also been unusually heavy with the result that a scarcity has developed in the Eastern market. Operators having loose tonnages available for this Western demand have been obtaining a much better profit and the indications are that this has become a permanent feature of the local trade. This condition has brought about a much freer buying movement which is being further stimulated by the general belief that there will be a tremendous car shortage the coming fall. Screened gas coal is quoted at $1.25@1.40, mine-run $1@1.30, with slack at 80@90c. per ton.

The lower grade gas coals are in poor demand and are as weak or weaker than the same grades of steam fuel. The better quality steam fuels are in short supply; the majority of these have been contracted for and consumers who buy in the spot market may find themselves in difficulty before long. Big Vein Georges Creek is now selling around $1.60 with the next better grades, such as Tyson and Quemahoming being quoted at $1.25 to $1.35.

Reports are generally to the effect that practically all of last year's contracts have been signed up again. Coastwise and export shipments from the local piers were unusually heavy during the week. Coke is weak and the output further reduced.

BUFFALO, N. Y.

There is a good demand for all grades and sizes of bituminous coal. Mindful of tariff agitation and the uproar of strikes, in Buffalo at least, the members of the coal trade are much pleased at the activity in the local market. Slack, which often begins to show weakness as summer approaches, is fully as strong as sizes. But for the weakness in coke there would be a uniform strength in the trade. There is a difference of opinion as to the reason for the lack of activity in coke. Some say there is an over-production and others that the iron trade is not in a satisfactory condition. There is iron enough in consumption, but the price is not satisfactory.

Another reason for a good bituminous demand is the continued shortage of miners. Scarcely a mine represented here has men enough to satisfy its needs and in some instances where an operator has a good many contracts he has difficulty in filling them.

There seems to be a general belief that politics or disturbances of any sort are not going to reduce the general consumption and so long as that remains the coal must be provided. Buffalo, for instance, is building as never before and the locomotive works at Dunkirk reports a large order of locomotives just taken and so on. The tariff bill as passed by the House is detrimental to the local trade but business goes on as before and it is seldom that buyers are so eager for shipments unless they are trying to stock up. The trade sees no likelihood of a dropping off in demand.

Bituminous prices are, therefore, strong at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack. Coke is plentiful and weak at $5 for best Connellsville foundry. There is no change in the price of smithing or cannel.

The Anthracite Trade is still quiet. Shippers speak of it as healthy but they do not look for a brisk demand again till fall. Consumers feel easy and are mostly well supplied with coal bought late last winter. The week's shipments of anthracite from Buffalo by lake were 132,000 tons.

COLUMBUS, OHIO

With an expanding lake trade and a good demand for steam grades, the coal trade in Ohio has been firm and active during the past week. Prices with the exception of the fine grades, have been well maintained and coal men generally believe the business will continue active for some time to come. No price cutting of any consequence is reported.

One of the best features is the larger requisitions from manufacturing concerns. Business generally shows improvement and this is reflected in larger orders from many lines of manufacturing, especially iron and steel mills. Railroads are also taking a larger tonnage since the troubles resulting from the flood are passing away. Some congestion is still reported at junction points but the movement of freight is now prompt.

A number of the railroad fuel contracts were made during the past week and they were generally at a marked advance over the quotations of last year. In some cases the contracts were awarded with a provision for an increase of 5c. on the ton toward the latter part of the year. All steam contracts renewed at this time are at higher figures than last year.

The lake business is one of the most active branches of the trade. Outside of some congestion at the upper lake ports, no trouble is experienced. The congestion, which it is believed will only be temporary, was caused by the movement of dozens of boats at the opening of navigation and consequently a lack of unloading machinery at the head of the lakes. When the movement becomes more uniform the congestion will be relieved.

There is practically no demand for domestic grades, although dealers are making preparations for an active consumption somewhat earlier than usual. This is due to the

fact that the flood caused dealers to sell out stocks closer than usual.

The output in Ohio fields during the week has shown a good increase. This is especially true in Eastern Ohio where the production is up to normal and about capacity. In the Hocking Valley district it is about 90 per cent. of the average. In the Pomeroy Bend field where the greatest damage was done by the flood, the output is about 65 per cent.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50	.....	$1.50	$1.50
¾-inch	1.35	$1.20	1.35	1.30
Nut	1.25	.....	1.25	....
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.70	.....	0.70	0.70
Coarse slack	0.60	0.70	0.60	0.60

HAMPTON ROADS, VA.

The movement of coal from tidewater during the past week has been very satisfactory; there have been some large shipments both coastwise and foreign and the accumulation of cars in the railway yards has been considerably reduced, although there still remains more than the normal quantity. Quite a fleet of vessels remain at anchor off Lamberts Point and at Newport News, waiting berth, and these, together with others now due, should keep both piers working to their full capacity during the coming week. Shortage of labor has somewhat delayed loadings at Newport News and the large number of bunker steamers arriving at Lamberts Point have kept the berths occupied, coastwise tonnage suffering accordingly.

Prices for the week have remained firm with some small sales at $2.80 for prompt shipment. The Government has loaded into colliers during the past week approximately 15,000 tons from various shippers which is, of course, all contract coal. Dumpings at Sewalls Point have been good and there is no accumulation of tonnage in the stream.

BIRMINGHAM, ALA.

Not much can be added to our last week's report on conditions obtaining in the coal trade in Alabama. Steam coal business is still depressed to the extent that some extraordinarily low prices are being quoted, and while this tonnage is not large the entire steam market is suffering from the effect.

A shortage of coal cars on one of the largest railroads in the district is growing more serious daily, a number of the mines on that line having lost from 20 to 35 per cent. time during the past two weeks. This condition is not quite understood by the operators as the railroad in question is in a financial position to secure all the equipment needed. A slight improvement is apparent in the domestic coal market. Prices are firmer and dealers are taking in a normal supply of stock coal.

LOUISVILLE, KY.

Indications point to a general easing up in the situation here. Local prices have fallen off to the customary summer level with the better grades of domestic lump selling at $4, but this general reduction has failed to bring about any responsive demand. Dealers themselves are doing but little stocking. In view of the curtailed work at the mines it is rather surprising to note that the shortage of screenings has at last been overcome and this in spite of the fact that the demand continues rather brisk.

The customary summer circulars are in effect which means that consumers buy at practically their own figures. It is a notable fact, however, that prices are almost invariably held at an advance of 10c. over last year's figures; the steam grades are showing even more substantial advances than this. The better grades of eastern Kentucky block are quoted at $1.85 f.o.b. mines, although this figure would be rather high in the larger competitive centers. The poorer qualities are from 25 to 40c. below this figure. Nut and slack are heavy at 70 to 90c. for the better grades with western Kentucky selling at 75 to 85c., and pea and slack are 35 to 45.

INDIANAPOLIS, IND.

Coal operators see some slight let-up in industrial activity, apparently, but not enough to excite comment. Sales of steam grades are not materially smaller than usual in May; mines are working about half time and their shipments of the domestic grades are practically nil.

Eastern mines are moving domestic into this state, retailers wishing to take advantage of the summer schedule of prices. This is particularly true of anthracite and Pocahontas and some Virginia splits that rise in price monthly. Other Ohio and Virginia coals that hold to about one level from April to September are not moving so freely at present. Indiana domestic can be shipped to the retail points in a day from the mines, and retailers do not stock up until fall, October usually being the best month. Freight rates are a handicap to steam grades from other states, but to those points in the state where the home rate runs 60 to 80c., considerable shipments of steam grades come from nearby states.

Screenings are selling around 90c., with a range of 10c. for quality and urgency of demand. Indianapolis retailers are pushing business while prices are low and customers are responding better than usual, following their experience of the last winter when prices were at record marks. While the buying will not be large in May, which is usually a breathing spell for the consumer after the winter's drain on his finances, there are indications that the succeeding months will find the retail trade active. Mine prices are unchanged.

Local dealers came down May 1 to their summer schedule, though they would not guarantee the present level to last longer than June 1. The new prices are:

Anthracite, chestnut	$8.00	Hocking Valley lump	$4.50
Anthracite, stove and egg	7.75	Luhrig lump	4.50
Anthracite, grate	7.50	Luhrig washed egg	4.75
Pocahontas, forked lump	5.50	Cannel	6.50
Pocahontas, shoveled lump	5.00	Linton No. 4 lump	3.25
Pocahontas, mine run	4.00	Linton No. 4 egg	3.25
Pocahontas, nut and slack	3.50	Indiana washed egg	3.50
Blossburg	5.50	Brazil block	4.00
Jackson (Ohio)	5.25	Indianapolis lump coke	6.00
Kanawha lump	4.50	Indianapolis crushed coke	6.00
Kanawha egg, nut	4.50	Connellsville lump	7.00
Pittsburg lump	4.50	Citizens' egg coke	6.00
Raymond lump	4.50	Citizens' nut coke	6.00
Winifrede lump	4.50		

DETROIT, MICH.

Bituminous—The local market is rather quiet, and, while spot prices continue unchanged, the trade is undeniably weak and liable to sharp break should there be any unusual overshipments. There is no change in the contract situation, buyers still holding off in the hopes of a break in the new high prices of the year. Operators are equally determined in their position in the matter, and just what the outcome will be is difficult to anticipate at the present moment.

It is stated at some points that dealers are slow about closing for smokeless coal for domestic purposes, because of the particularly high prices demanded on contract. Some buyers, however, report that they have signed up for as much of this grade as they require.

Market quotations are as follows, f.o.b. mines:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.50	....	....	....	....	$2.25	$2.00
Egg	1.50	....	$1.35	....	....	2.25	2.00
1¼-in. lump	1.25	....	....	....	....	....	....
¾-in. lump	1.20	$1.20	$1.20	$1.20	$1.20	....	....
Mine-run	1.10	1.10	1.10	1.10	1.10	1.50	....
Slack	1.00	1.00	1.00	1.00	Open	Open	....

Anthracite—The hard-coal market in this vicinity has been heavily over-shipped, and the trade is dull. The large movement in March and April, which was succeeded by an almost unprecedented spell of mild weather, restricting consumption down to the smallest minimum in all the contiguous territories, has left the dealers and consumers overstocked almost without exception. Some dealers are buying sparingly, but the tonnage is light; the stimulation which ordinarily follows the reduced circular, has not been felt at this time.

Coke—Connellsville coke is quoted at $3.10, Semet Solvay, at $3 f.o.b ovens, with the trade comparatively active and strong.

CHICAGO

There is a wide range of prices prevailing in the Chicago coal market due to a variety of reasons. One of the chief factors has been a marked increase in competition which resulted in deep cuts in selling prices by a number of operators and dealers. In the Franklin County domestic trade the larger producers are demanding $1.35 for spot shipment and from $1.35 to $2 on contracts. Other operators are offering a much lower series of prices. There are some producing companies selling Carterville coal at $1.40, the mines, for domestic lump and $1.65 for No. 1 washed coal. On the other hand, a few of the operators in this field will accept prices ranging from 25c. to 35c. a ton lower.

A large number of contracts are being let for Eastern coals. Prices, generally, are good. A comparatively small volume of smokeless is reaching the Chicago market owing to a light demand. On account of a curtailment in production, the supply of coke at present is scarce and the market for this commodity remains firm. There is a strong demand for steam coal. Announcement has been made of an advance in the price of screenings of about 5c. a ton.

Coke—Connellsville and Wise County, $5.25@5.50; byproduct, egg, stove and nut, $4.55@4.75; gas house, $4.65@4.75.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1.97@2.07	$2.30@2.40	$2.27	
Egg		2.30@2.40		$3.65
Steam lump	$1.82@1.87		2.07	
Mine-run	1.77	2.20@2.30	1.97	3.30
Screenings	1.57	1.95	1.57@1.62	

MINNEAPOLIS—ST. PAUL

The all-rail business is extremely light at this time. There is not an over amount of coal pressing the market as many mines have been closed more or less of late, owing to floods. Prices on Harrisburg are quoted at $1.30 to $1.40 for lump and egg; the price for mine-run is $1.20. Screenings are scarce, and the price now is $1 at the mines, with contract price at 80c. Other grades of Illinois screenings are hard to get and, at the docks, it will be some time before enough screenings can be worked through.

ST. LOUIS, MO.

The usual dullness in the spring trade prevails in St. Louis and adjacent territory. There are a few calls for contracts in steam lines, but other than that very little is doing, and contracts are not looked upon with favor by shipping interests.

There is a slight increase in the prospects for the anthracite movement this month, and some inquiries for smokeless. The coke market, however, is dull. Screenings, still sell for 80c. at the mines and Carterville at $1. The washed coal market seems to be holding its own, with No. 3 and No. 4 in extra good demand. There is also some call for Arkansas anthracite, but not to the extent as in former years.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.90
3-in. lump	.....	.....	$1.20	.....
6-in. lump	$1.15 @ 1.20	.....	1.25	1.05
Lump and egg	.....	$2.25	.....	.....
No. 1 nut	1.05 @ 1.15	.....	.....	.....
Screenings	0.90 @ 0.95	.....	.....	0.85
Mine-run	1.00 @ 1.10	.....	.....	0.80
No. 1 washed nut	1.35	.....	.....	.....
No. 2 washed nut	1.35	.....	.....	.....
No. 3 washed nut	1.35	.....	.....	.....
No. 4 washed nut	1.35	.....	.....	.....
No. 5 washed nut	1.10	.....	.....	.....

St. Louis prices on May anthracite are: Chestnut, $7.50; stove and egg $6.80; grate $6.55. Smokeless lump and egg is $4.45 and mine-run $4. By product coke is $5 and gas house $4.75.

OGDEN, UTAH

The Utah operators seem to have been the prime factor in reduction of price f.o.b. mines. They have either solved the secret of cheap mining and wish to give the public the benefit or are endeavoring to force their coal on the market.

No dealer cares to store coal in May for three principle reasons: First, because there is no demand while there are a lot of unpaid accounts on the books covering winter coal, which means money tied up; second, the depreciation on the coal and interest on the money invested is greater than the reduction in price f.o.b. mines; third, because there is no reason for buying coal in May when it can be obtained at the same price in July and August. Consequently, during May, about the only coal bought will be for current demand and, of course, will be sold at the storage price.

PORTLAND, ORE.

Utah mines have announced the reduction of 25c. per ton for coal during the storage season and the delivery price here in five-ton lots or over is now $9.50 per ton. Dealers expect that Wyoming mines will announce a similar reduction within the near future. There has been no change in Australian coal quotations here since last fall. This is the quietest time of the year in the coal business here and no great amount of business is anticipated for some weeks. The market is steady, however, and values fully as high as at the corresponding time a year ago.

PRODUCTION AND TRANSPORTATION STATISTICS

SOUTHWESTERN TONNAGE

The following is a comparative statement of the southwestern tonnage for February and the first two months, 1912 and 1913:

State	February 1912	February 1913	Two Months 1912	Two Months 1913
Missouri	305,759	260,586	587,212	566,411
Kansas	501,121	414,413	1,039,049	938,018
Arkansas	176,210	130,888	431,876	313,536
Oklahoma	267,731	297,004	616,713	663,863
Totals	1,250,821	1,102,891	2,574,850	2,482,82

ANACONDA COPPER MINING CO.

The following is a comparative statement of this company's coal production over the last three years:

	1912	1911	1910
Coal produced	837,815	800,073	828,531
Shipped to other departments	514,208	508,913	449,421
Sold	244,685	316,647	309,242
Used at coal mines	78,922	74,513	69,868

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended May 1, as follows:

	Surplus	Shortage	Net*
New England Lines	75	150	75
N. Y.; New Jersey, Del.; Maryland; Eastern Penn.	4,036	451	**3,585**
Ohio; Indiana; Michigan; Western Pennsylvania	230	1,340	1,110
West Virginia, Virginia, North & South Carolina	779	1,369	590
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	222	295	73
Iowa, Illinois, Wis., Minn.; North & South Dakota	1,519	35	**1,484**
Montana, Wyoming, Nebraska	592	0	**592**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	1,788	89	**1,699**
Texas, Louisiana, New Mexico	297	0	**297**
Oregon, Idaho, California, Arizona	2,591	4	**2,587**
Canadian Lines	114	0	**114**
Totals	12,243	3,733	**8,510**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,548**
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	**8,406**

***Bold face** type indicate a surplus.

FOREIGN MARKETS

GREAT BRITAIN

May 2—The miners at several collieries have not yet resumed work after the May-Day labor demonstration, but the general impression is that these stoppages will not last for long. The prevailing market is as follows:

Best Welsh steam	$5.10@5.22	Best Monmouthshires	$4.56@4.68
Best seconds	4.92@5.04	Seconds	4.44@4.50
Seconds	4.74@4.86	Best Cardiff smalls	3.48@3.60
Best dry coals	4.74@4.92	Seconds	3.48

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending May 10.

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	32	31¼	31¼	41½	31
Colorado Fuel & Iron Pref.	....	....	155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Lehigh Valley Coal Sales	225	210	215	....	....
Island Creek Coal, com	52	51	51	....	....
Island Creek Coal Pref.	85	84	84	....	....
Pittsburgh Coal	18¾	17½	18	24¾	17½
Pittsburgh Coal Pref.	83	83	83	95	79¾
Pond Creek	22¼	19¼	19¼	23¾	19¼
Reading	162¼	159¼	160½	168¾	152½
Reading 1st Pref.	91	90	90	92½	89¾
Reading 2nd Pref.	89½	89½	89½	95	87¾
Virginia Iron, Coal & Coke	45	43	43	54	43

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g. 5s	95	98½	95	April '13	95	99½
Colo. F. & I. gen. 6s	..	..	107½	June '12	..	..
Col. Ind. 1st & coll. 5s. gu	78¼	80	78¼	78¼	78¼	85
Cons. Ind. Coal Me. 1st 5s	75	80	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102¾	April '06	..	..
K. & H. C. & C. 1st s f g 5s	..	..	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	..	87½	87½	Mar. '13	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	76	78	76	Mar. '13	76	80
Tenn. Coal gen. 5s	..	101¾	100	100	100	103
Birm. Div. 1st consol. 6s	101½	103¾	101	April '13	101	103
Tenn. Div. 1st g 6s	..	103¾	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	..	104	110	Jan. '09	..	..
Utah Fuel 1st g 5s	..	..	..	....	..	..
Victor Fuel 1st s f 5s	80	Sale	80	80	79¾	80
Va. I. Coal & Coke 1st g 5s	93	97	93	May '13	93	98

No Important Dividends were announced during the week.